SEVERN TRENT SERVICES

AZTEC SERIES 5000

SINGLE AND DOUBLE DISSOLVED OXYGEN (DO) SYSTEMS

&

COMBINED DO and MIXED LIQUOR SUSPENDED SOLIDS (DO-MLSS) SYSTEM

INSTALLATION & COMMISSIONING MANUAL

Part No: 04-5003-D
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These instructions describe the installation, operation and maintenance of the subject equipment. Failure to strictly follow these instructions can lead to an equipment rupture that may cause significant property damage, severe personal injury and even death. If you do not understand these instructions, please call Severn Trent Water Purification for clarification before commencing any work at 215-997-4000 and ask for a Field Service Manager. Severn Trent Water Purification, Inc. reserves the rights to make engineering refinements that may not be described herein. It is the responsibility of the installer to contact Severn Trent Water Purification, Inc. for information that cannot be answered specifically by these instructions.

Any customer request to alter or reduce the design safeguards incorporated into Severn Trent Water Purification equipment is conditioned on the customer absolving Severn Trent Water Purification from any consequences of such a decision.

Severn Trent Water Purification has developed the recommended installation, operating and maintenance procedures with careful attention to safety. In addition to instruction/operating manuals, all instructions given on labels or attached tags should be followed. Regardless of these efforts, it is not possible to eliminate all hazards from the equipment or foresee every possible hazard that may occur. It is the responsibility of the installer to ensure that the recommended installation instructions are followed. It is the responsibility of the user to ensure that the recommended operating and maintenance instructions are followed. Severn Trent Water Purification, Inc. cannot be responsible deviations from the recommended instructions that may result in a hazardous or unsafe condition.

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Severn Trent Water Purification, Inc. takes all reasonable precautions in packaging the equipment to prevent shipping damage. Carefully inspect each item and report damages immediately to the shipping agent involved for equipment shipped "F.O.B. Colmar" or to Severn Trent Water Purification for equipment shipped "F.O.B Jobsite". Do not install damaged equipment.

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COLMAR, PENNSYLVANIA, USA
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1 INTRODUCTION

1.1 Scope

This manual describes the installation and commissioning of the ***Aztec Series 5000 Dissolved Oxygen (DO) System*** with or without additional MLSS measurement. It should be read and understood before the equipment is placed into service.

The larger User Manual (part number 04-5002) is included on the CD supplied with the instrument and includes additional information to enable safe and continuing operation of the equipment.

1.2 Important Notices

1. **SEVERN TRENT SERVICES** reserve the right to make engineering refinements to the equipment that may not be described herein. Any questions that cannot be answered specifically by these instructions should be addressed to **SEVERN TRENT SERVICES** or their agents for response.

2. **SEVERN TRENT SERVICES** will not accept responsibility for any equipment supplied or the actions of such equipment or associated system when the customer has made a modification that is considered by **SEVERN TRENT SERVICES** to be detrimental to the operation of the equipment.

1.3 Intended Audience

This manual is for reference by design engineering staff and installation & commissioning engineers responsible for deploying the equipment.

1.4 Using this Manual

This manual contains six chapters These six chapters comprise this *Introduction* and five others:

- **Safety Procedures** – outlines steps that should be taken to ensure safe use of the equipment. This section must be read prior to installation.

- **Design** – gives a brief description of the ***Aztec Series 5000 Dissolved Oxygen System*** and the function it performs.

- **Specification** – provides technical details of the ***AZTEC Series 5000 Dissolved Oxygen System***.

- **Installation** – describes the recommended method of installation.

- **Commissioning** – provides commissioning details of the ***AZTEC Series 5000 Dissolved Oxygen System***.

In addition, there are three appendices taken from the larger user manual.

- **Appendix A** – Certificate of Conformity
- **Appendix B** – Warranty Exclusions
- **Appendix D** – Software Licence Agreement

2 SAFETY PROCEDURES

The recommended installation and operating procedures have been designed with careful attention to safety. **Severn Trent Services** has made formal safety reviews of the initial design and any subsequent changes. This procedure is followed for all new products and covers areas in addition to those included in applicable safety standards.

The following safety precautions should be observed:

1. Observe all safety warnings marked on the equipment. These warnings identify areas of immediate hazard, which could result in personal injury or loss of life.

2. Do not use this equipment for any other purpose other than described in this manual.

3. Only suitably qualified personnel should carry out work on this equipment.

4. Disconnect power to the apparatus prior to making any terminal connections within the electronics enclosures.

   Note: Alarm outputs, if used, are externally powered and could be carrying mains (line) voltage. The instrument's mains power isolator does NOT isolate these circuits. In these circumstances, the installer should provide a separate means of isolation and supplementary warning labels

5. Do not operate the equipment with the electronics enclosure open. Operation without the protective covers may present an electric shock hazard.

6. Use all practical safety precautions to prevent contact with energised parts of the equipment and related circuits.

7. Use the recommended connection procedures described in the installation section.

8. Only suitably qualified personnel should perform installation.

9. When in use, compressors, valves and pneumatic cylinders may all stop and start automatically. Suitable caution should therefore be exercised when working on the unit. If carrying out maintenance work on the DO sensors, entering the maintenance ('9999') menu should disable the automatic mode.

10. DO NOT under any circumstances insert fingers into the space between the sensor and shroud.

11. The DO system is designed to operate in wastewater plants. Removal and maintenance of the wet end assembly poses a potential biological hazard. Protective clothing should be used, open wounds should be protected and skin or mucous membrane contamination should be washed off as soon as possible. If accidental ingestion of biomass or wastewater occurs, medical advice should be sought immediately.

12. The **AZTEC DO system** is often supplied with an integral compressor. On calibration, this may run for an extended period resulting in the motor housing becoming hot. Care should be exercised if the compressor box is cover is removed.

13. Makareth cells are supplied stored in a sodium sulphite solution. Refer to the following Material Safety Data Sheets before handling.

MSDS SHEET:

SODIUM SULPHITE SOLUTION – 3% to 10% w/v in water

Common Names:

SODIUM SULPHITE SOLUTION
SODIUM SULFITE SOLUTION
DO ELECTRODE STORAGE SOLUTION

MSDS Contents – Information on the topics in the list below are provided.

1. PRODUCT IDENTIFICATION
2. COMPOSITION/INFORMATION ON INGREDIENTS
3. HAZARD IDENTIFICATION
4. FIRST AID MEASURES
5. FIRE FIGHTING MEASURES
6. HANDLING AND STORAGE
7. EXPOSURE CONTROL/PERSONAL PROTECTION

MATERIAL SAFETY DATA SHEET

THE FOLLOWING INFORMATION, BASED UPON CURRENT KNOWLEDGE AND EXPERIENCE OF THE PRODUCT IS NOT EXHAUSTIVE. IT APPLIES TO THE PRODUCT AS DEFINED BY THE SPECIFICATIONS. IN CASE OF COMBINATIONS OF MIXTURES, ONE MUST CONFIRM THAT NO NEW HAZARDS ARE LIKELY TO EXIST. IN ANY CASE, THE USER IS NOT EXEMPT FROM OBSERVING ALL LEGAL, ADMINISTRATIVE AND REGULATORY PROCEDURES RELATING TO THE PRODUCT, PERSONAL HYGIENE, AND INTEGRITY OF THE WORK ENVIRONMENT. (UNLESS NOTED TO THE CONTRARY, THE TECHNICAL INFORMATION APPLIES ONLY TO PURE PRODUCT).

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1. PRODUCT IDENTIFICATION

1.1 PRODUCT NAME: SODIUM SULPHITE SOLUTION;

1.2 CHEMICAL NAME: INORGANIC SODIUM COMPOUNDS.

1.3 SYNONYMS: DO ELECTRODE STORAGE SOLUTION.

2. COMPOSITION / INFORMATION ON INGREDIENTS

CONSISTS OF AN AQUEOUS SOLUTION CONTAINING TYPICALLY 3g BUT POSSIBLY UP TO 10g ANHYDROUS SODIUM SULPHITE PER 100 ml WATER. DECOMPOSES IN AIR TO SODIUM SULPHATE BY ABSORPTION OF OXYGEN.

3. HAZARD IDENTIFICATION

3.1 ANHYDROUS SOLID SODIUM SULPHITE IS AN ODOURLESS, FREE FLOWING WHITE CRYSTAL. ITS SOLUTION IN WATER IS USED AS A STORAGE MEDIUM FOR SENSORS REQUIRING AN OXYGEN-FREE STORAGE ENVIRONMENT.

3.2 ROUTE(S) OF ENTRY:

INHALATION?	NO
SKIN?	YES
INGESTION?	YES

3.3 EFFECTS OF EXPOSURE:

	MAY CAUSE IRRITATION
EYES:	MAY CAUSE IRRITATION
SKIN:	MAY CAUSE IRRITATION
INGESTION:	ORAL EXPOSURE OR SWALLOWING MAY PRODUCE GASTROINTESTINAL UPSET, NAUSEA OR VOMITING. INGESTION MAY BE FATAL. SULPHITE SENSITIVE INDIVIDUALS MAY EXPERIENCE A SEVERE ALLERGIC REACTION.

3.4 LIBERATES SULPHUR DIOXIDE IN CONTACT WITH MINERAL ACIDS.

4. FIRST AID MEASURES

THOROUGHLY RINSE ANY SPILLAGES ON THE SKIN WITH CLEAN WATER. IRRIGATE EYES IMMEDIATELY WITH WATER IF SPLASHED AND SEEK MEDICAL ATTENTION.

SEEK IMMEDIATE MEDICAL ATTENTION IF INGESTED.

5. FIRE FIGHTING MEASURES

5.1	FLASH POINT:	NON-COMBUSTIBLE.
5.2	FIRE FIGHTING METHOD:	NOT APPLICABLE
5.3	AUTOIGNITION TEMPERATURE:	NOT APPLICABLE
5.4	FLAMMABILITY LIMITS:	LOWER LIMIT: NON-FLAMMABLE UPPER LIMIT: NON-FLAMMABLE

5.5 UNUSUAL FIRE AND EXPLOSION HAZARDS: IF HEATED TO DRYNESS NON-COMBUSTIBLE. SODIUM SULPHITE GENERATES HAZARDOUS SULPHUR DIOXIDE DURING DECOMPOSITION.

5.6 COMMON EXTINGUISHING METHODS: NOT APPLICABLE

6. HANDLING AND STORAGE

QUANTITIES INVOLVED ARE SMALL. HOWEVER, YOU SHOULD STILL WEAR PROTECTIVE GLOVES AND GOGGLES WHEN HANDLING. STORE IN THE CONTAINER PROVIDED AND KEEP THE CONTAINER CAPPED WHEN NOT IN USE.

7. EXPOSURE CONTROL/PERSONAL PROTECTION

AVOID DIRECT OR INDIRECT CONTACT WITH THE SOLUTION. WEAR PROTECTIVE CLOTHING, GLOVES AND EYE PROTECTION.

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3 DESIGN

3.1 General Design

In the basic DO System there are two physically separate connected assemblies - the Main System Assembly and the DO Probe Assembly.

In addition to this, where requested, a DO Local Control Box (LCB) can be supplied. One DO Local Control Box is supplied as standard for a double DO probe system for distributing compressed air to the additional DO probe assembly. It enables the user to test the function of an additional DO Probe Assembly local to the extra probe rather than at the main panel.

Figure 1 - Typical arrangement of an AZTEC double DO System

3.2 Main System Assembly

When so ordered the Main System Assembly is normally despatched as a pre-assembled unit and consists of:

1. Main backboard with Unistrut™ channel and pre-wired isolator
2. Electronics Module, solenoid valves and optional compressor.

3.3 DO Probe Assembly

The DO Probe Assembly is normally despatched in a kit form with separate assembly instructions. The DO cell is a fragile device and should be fitted during installation/commissioning.

There may be more than one DO Probe Assembly (i.e. a double DO system) controlled by the Main System Assembly.

The DO Probe Assembly consists of:

1. Mounting bracket (Optional)
2. Support pole (Optional)
3. Wet end assembly (fixed to end of support pole)

3.4 DO Local Control Box (LCB)

This is normally despatched as a pre-assembled unit with a mounting plate attached. It provides all the interface hardware local to the sensor in addition to a facility to test the mechanical operation of the cleaning and calibration components during maintenance.

These three assemblies are described in more detail later.

3.5 Pneumatic Connections

The pneumatic tubes, which run between the assemblies, are connected with 6mm push-fit connectors. Prior to shipping, blanking plugs (part No. 25-5089) are fitted to the panel connectors and these should be removed immediately prior to commissioning. It is recommended that the blanking plugs be re-fitted if the Wet End is disconnected for extended periods. Experience has shown that some insects use the open ends of the pneumatics to nest and consequential partial blockage results in erratic operation.

The push-fit connectors retain the pneumatic tubes by means of a barbed collet, which tightens onto the tube if any force is exerted that could otherwise pull the tube out.

When fitting each pneumatic tube ensure that it passes fully through the “O” ring in the push fit connector or serious malfunctions will occur.

3.6 Operational Principles

The **AZTEC DO system** provides for the user a reliable self-cleaning, autocalibrating dissolved oxygen measuring system, which is capable of storing 15 minute average data, including DO in % saturation and mg/l, temperature and various other useful internally generated parameters. In addition, it stores detailed information every time it carries out a calibration, thus enabling rapid and easy interpretation of its condition.

The instrument has three operating modes:

a) Normal measuring mode

b) Calibration and cleaning mode

c) Manual intervention mode

For the majority of the time the instrument operates in normal operating mode, during which time the sensor (either Clark or Makareth) responds to aqueous DO concentrations by producing a current (microamperes) that is proportional to the DO concentration. The current is fed into a DO head amplifier thus generating a voltage (0 to 5 Volts) proportional to DO, which is then registered in the electronics module via an analogue input channel.

A thermistor in the sensor head also responds to the liquor temperature. The temperature thus recorded is used to convert the percentage saturation readings into mg/l.

The calibration and cleaning modes are initialled either automatically at user settable intervals, or manually via the front keypad.

Cleaning of the sensor is achieved by means of a pneumatically actuated cylinder, which pushes a shroud down over the sensor head. There is an annular brush housed in the end of the shroud, which brushes over the face of the sensing element as the shroud moves.

Moving the sensor into the inside of the shroud and then blowing air through the annular space between shroud and sensor affects calibration. This is continued for a given period to allow equilibrium to be attained, after which the reading is adjusted to give a corrected 100% saturation value.

The manual intervention modes are accessible by typing a code on the front panel keyboard. This will suspend normal operation and allow manual control of the piston and aeration functions. These modes are used for maintenance and diagnostic purposes.

Further detail of operation and the different modes is given in sections 7 and 8.

3.7 Access to Data

Three methods of data access are available:

1. **Front Panel Interface** (Local Mode)

2. **Local Serial Communications Access via a PC or similar**

3. **Remote Serial Communications Access via modem, PSTN and PC or similar**

3.7.1 Front Panel Interface (Local Mode)

Using the front panel interface keypad and display it is possible to check the current state of the instrument and configure, test and alter basic aspects of its setup. Further details on the use of the keypad can be found in section 8.

Advanced configuration of the instrument must be carried out via the serial communications. **Severn Trent Services** staff should be consulted before attempting this.

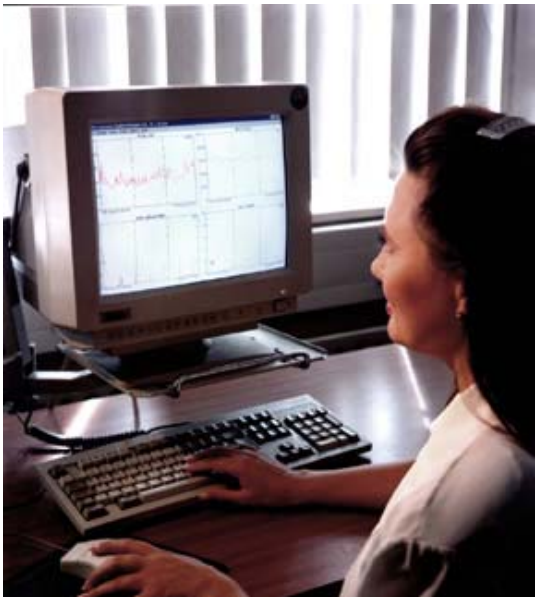
3.7.2 Local PC Access (Serial Communications)

An RS232 serial port is available. A connector socket is provided for local PC access or other suitable ASCII terminal connection. More information on serial communications connection may be found in Section 9 Serial Communications.

Both stored fifteen-minute averages and detailed area can be recovered from the processor onto a PC using a specially designed software suite, and the resultant data can be displayed and manipulated in a in a variety of ways. In addition, it is possible to access the main control program to interrogate the instrument to determine its current operating settings or to make modifications. For further information, please request literature on the PC Software suite (under separate cover).

3.7.3 Remote PC Access

Exactly the same features outlined in the previous section are available remotely, provided an error-correcting modem is connected to the serial communications connections, and the modem is linked to the PNTN network.



Remote communications via PC, modem and PSTN

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4 - DO TECHNICAL SPECIFICATION

Table 1** – General Specification for the **AZTEC Dissolved Oxygen System

ITEM	DESCRIPTION
Compliance	The unit complies with all relevant directives of the European Union and is CE marked to indicate this
Instrument parameter Ranges	Temperature: 0 to 50 Degrees C DO: 0 - 130% Saturation 0 - 10 mg/l (These are default values. Both are user re-configurable)
Measurement Principles	Temperature: Thermistor Dissolved Oxygen: Clark Type cell or Makareth cell
Measurement Mode	Continuous
Accuracy	Temperature: Better than 0.1 Deg C Dissolved Oxygen: Better than 1% Saturation
Analogue Outputs	4 – 20 mA into 1000 ohms Four parameters, configurable Connection via minimum of: twisted pair, individually screened, overall screened cable.
Digital outputs	Four (user configurable): Each channel comprising single pole changeover (SPCO) volt-free contact rated at 1A @ 250Vac with internal VDR suppressers fitted. LED indication of each relay output provided.
Serial Communications	RS232 or as an option RS422 available. Connection via minimum of: 3 twisted pair, individually screened, overall screened cable
Local Display	LCD two-line, 40-character alphanumeric
Local Keypad	Numeric membrane type
Power Supply	110/120VAC or 230VAC, 50-60Hz +/- 10%
Power Consumption	300VA if integral compressor fitted, 30VA if not
Ambient operating Temperature	-10 to +50 Degrees C
Liquid operating Temperature	0 to +45 Degrees C

ITEM	DESCRIPTION
Mounting	Main panel: vertical on handrails or site-specific frame Probe assembly: A stainless steel handrail bracket supports a 2.5 Metre long pole made from 1½" nominal ABS Class T pressure pipe 48mm OD x 6.35mm wall thickness. This pole has an undercut 1¼" British Standard Pipe Parallel thread (BSPP) (11 TPI Whitworth thread form) machined one end. The shoulder, formed by the undercut, is a sealing surface utilised by the square section "O" ring in the end face of the cylinder rod. THIS ARRANGEMENT MUST NOT BE SUBSTITUTED. All threaded fasteners ISO metric stainless steel.
Dimensions	Height Width Depth Without compressor 880mm 400mm 269mm With compressor 880mm 800mm 269mm Weight approximately 27Kg Pole assembly Normal Length 2.5m Extended pole 3.5m or 5m
Enclosures	GRP IP67 and NEMA 4X
Air Supply	Pressure: nominal 2 bar max. Must be fed through a regulator Flow at atmospheric pressure: 1 L/s maximum Connection: 6 mm push fit to take nylon tube Air Quality: Instrument quality Compressor normally provided

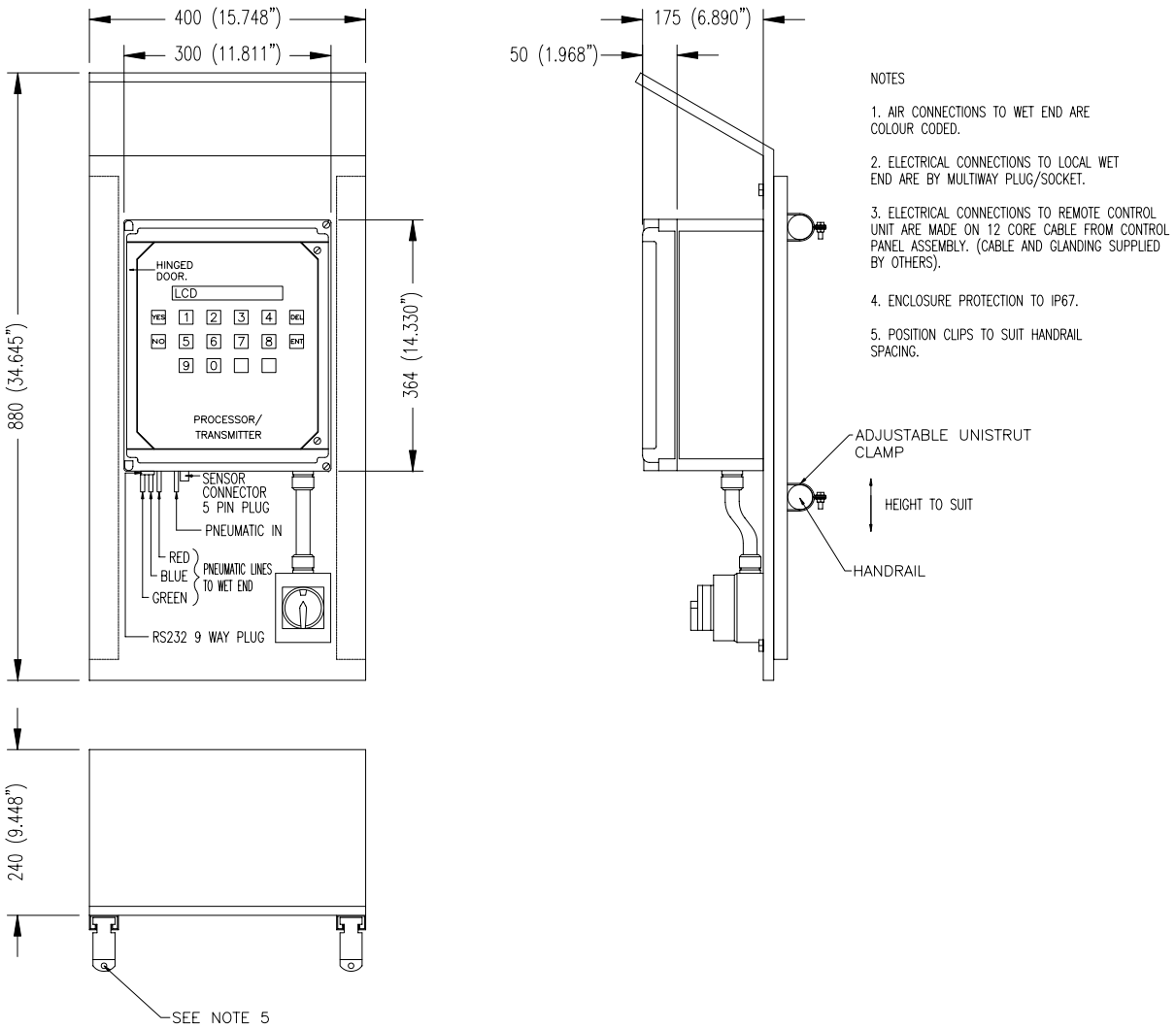


Figure 2 - System Dimensions (with optional mounting panel) – units in millimetres

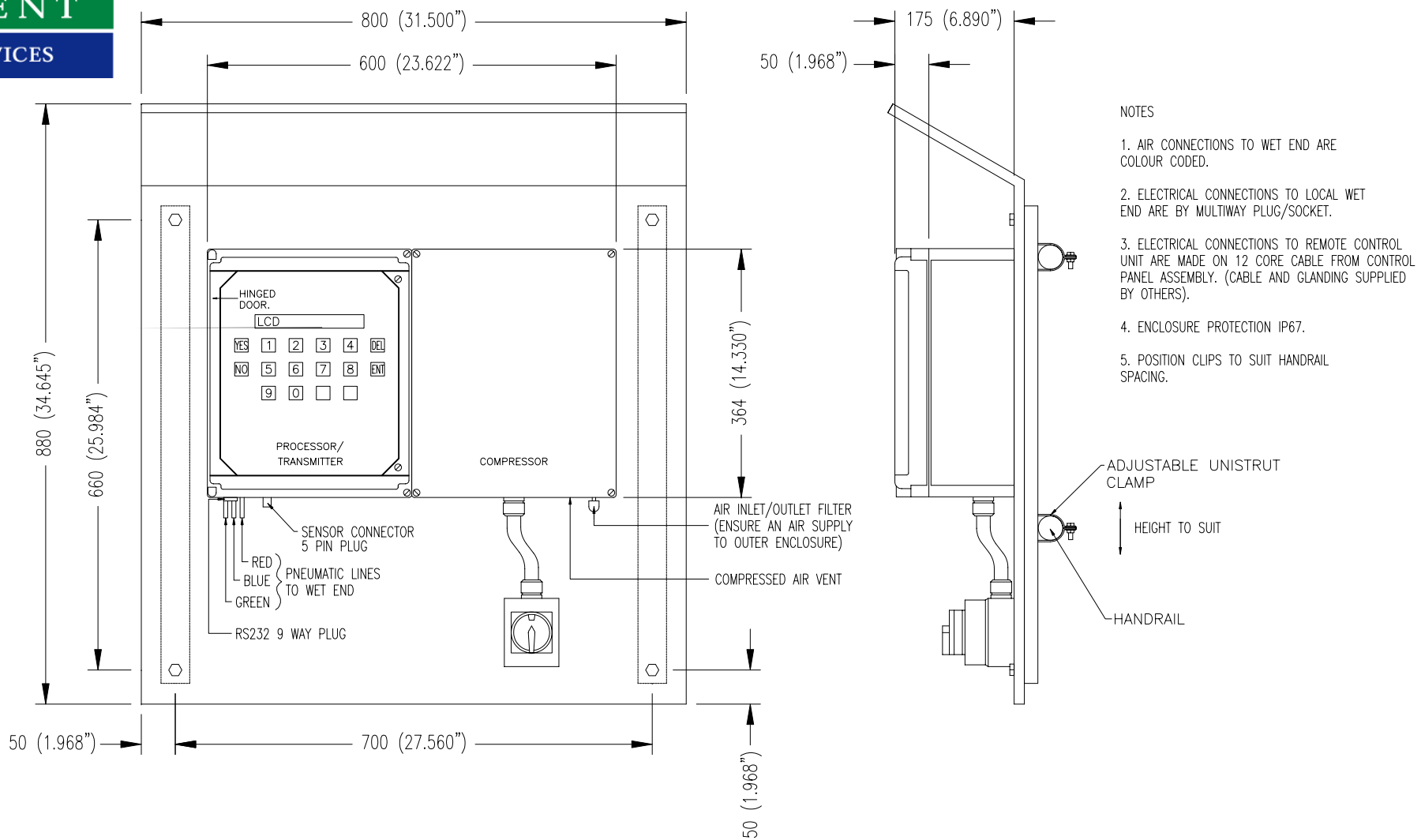


Figure 3 - System Dimensions (with optional mounting panel & integral compressor) - units in millimetres

5 INSTALLATION

5.1 General Rules

It is important that the installing engineer fully reads this manual prior to installation. To achieve successful operation, the correct installation and location of the ***AZTEC DO System*** is vital. Incorrect installation may result in premature life expiry of the DO Probe Assembly components and unrepresentative DO data may be obtained.

It is important that no "short-cuts" are taken.

Analogue signal and data communications conductors must be segregated from each other by screening, and from cables operating at different voltage classifications. This specifically relates to the cabling from the DO Probe Assembly, cabling from the Main System Assembly and any other plant cabling in the vicinity of the ***AZTEC DO System.***

Reference should be made to the Electricity Supply Regulations, the current Edition of the IEE Wiring Regulations and supporting documents (ERA, BSI and ISO standards publications).

Owing to the site-specific nature of process liquors, it is beyond the scope of this document to detail exact sensor location within a process area.

SEVERN TRENT SERVICES offer to provide customer support where site-specific advice is needed. Alternatively, **SEVERN TRENT SERVICES** is able to provide an installation service. **In spite of these uncertainties a number of general installation "rules" should be considered as detailed below:**

5.1.1 Recommended Locations

The installer must ensure that the ***AZTEC DO System*** assemblies are located to provide safe and easy access for the users and maintainers of the system. Successful existing installations have the Main System Assembly and the DO Probe Assembly adjacent to each other, and mounted on hand railing where this permits. The Main System Assembly when ordered is supplied with fittings to allow direct mounting on hand railing or similar support structure. The mounting height of the Main System Assembly should be between 1 metre and 2 metres above local floor level and front access must not be restricted.

The protection rating of the main system unit is IP67 and care should be taken that the installation will not compromise the integrity of the protection.

It is advisable to locate the DO Probe Assembly away from areas that are known to have:

a. Excessive organic growth patterns
b. Excessive levels of surface layer turbulence
c. Surface “scum/foam” accumulation.
d. Unrepresentative DO concentrations.

5.1.2 Personnel Skill Level

Electrical power connections must be carried out and commissioned by electrically competent authorised personnel who are fully conversant in the requirements of the intended installation. Instrumentation staff having at least technician status should carry out the remaining installation.

5.1.3 Test Equipment and Tools

WARNING

High voltage insulation test equipment (e.g. Megger tester) MUST NOT BE USED on the AZTEC DO or DO/MLSS Systems – severe damage may result and the warranty will become void.

The following tools and equipment are recommended for use during the commissioning exercise:

a. Flat blade terminal screwdriver
b. 5mm flat blade screwdriver
c. Multimeter (20mA / 50VDC / 500VAC / continuity range)
d. 17mm deep-socket wrench (spanner)

With respect to the multimeter, the attention of the commissioning engineer is drawn to the 1000-ohm maximum drive capability of the ***AZTEC DO System*** analogue signals.

The commissioning engineer must also be aware of the need for fused test leads for use in conjunction with any test meter, silicone **grease** for the Clark cell assembly and silicone **rubber** for the Makareth cell assembly.

5.1.4 Pre-commissioning checks and tasks

On receipt, the completeness of the **AZTEC DO System** should be checked against the parts list. Any shortfall in the delivery of signs of damage should be notified in accordance with the terms of sales/warranty.

Installation should be carried out in three parts:

a. Physical location and installation of the main electronics panel and in the case of a double DO system, the local control box.

b. Assembly, location and installation of sensor assemblies

c. Power, signal and commissioning wiring. Pneumatic tube connection

Details of the above are provided on the following pages.

5.2 Installation of Main Electronics Panel

The main system unit consists of either two or three modules mounted on a single polypropylene backboard.

The diagrams below show the typical layouts of the Main System Assembly both with and without an integral compressor.

Figure 4 - Main electronics panel without integral compressor

Figure 5 - Main electronics module with integral compressor & optional mounting panel

When so ordered, the units will be supplied on a polypropylene mounting board with Unistrut™ channel affixed to the rear face. In addition, a pre-wired isolator and Unistrut™ pipe clamps are provided, such that the whole assembly may be easily hung from handrails.

If an alternative mounting system is required then the Unistrut™ channel may be removed and the predrilled holes used for fixing by alternative means.

☞ In a double-DO system, the main panel should be installed adjacent to the first DO sensor assembly.

5.3 Physical Installation of Local Control Box

One local control box is normally supplied as standard with a double DO system.

The local control box contains the DO sensor head amplifier, pneumatic valves and wiring terminals for connection to the main panel for the wet end assembly situated remotely from the main electronics panel.

Front view

Figure 6 – Local Control box – Front view showing buttons

View of base

Figure 7 – Local control box – view of base showing connectors

5.3.1 Local Control Box Mounting

The local control box is supplied with the mounting plate already fixed to the box. The mounting plate should be fitted to the same mounting bracket securing the DO Probe Assembly. The plate is supported by the two V" bolt nuts nearest the locking wings which should be tightened down onto the mounting plate. See the diagram below for the positioning of the box onto the handrail-clamping bolt.

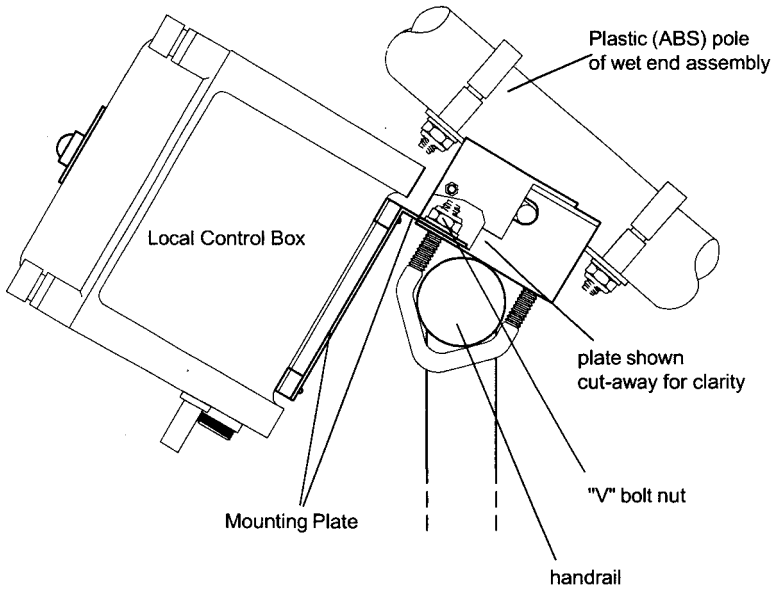


Figure 8 - Diagram showing the local control box mounting arrangement

5.3.1 Local Control Box Pneumatics

The colour-coded pneumatic tubes are fitted into the push-fit connectors as shown previously.

The air tubes from the probe are colour-coded red, green and blue.

Red	-	top of pneumatic cylinder
Green	-	bottom of pneumatic cylinder
Blue	-	aerate line down centre of support pole

The air supply, which may be from the Main System Assembly or from a site supply, is 6 mm nylon tube to BS5409 standard.

5.4 Main Probe Assembly Installation

5.4.1 General Description

When so ordered, the DO Probe Assembly will consist of the following options:

a) Mounting bracket
b) Support Pole
c) Wet-end assembly (fixed to the end of the support pole)

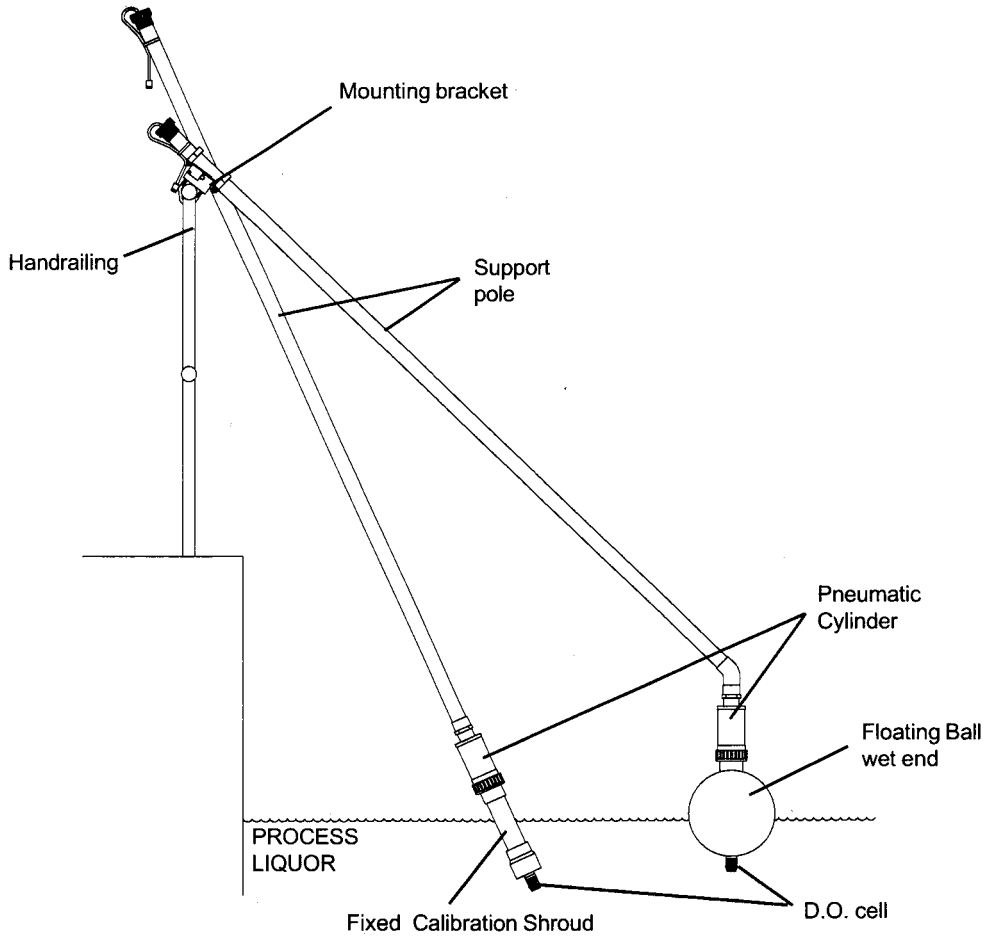


Figure 9 - Drawing showing installations of the floating ball and fixed shroud wet end DO assemblies.

5.4.2 Mounting Bracket

The optional mounting bracket shown below is suitable for direct mounting to handrail horizontal members of diameters up to 45mm.

The static parts are manufactured from stainless or galvanised steel and require no maintenance.

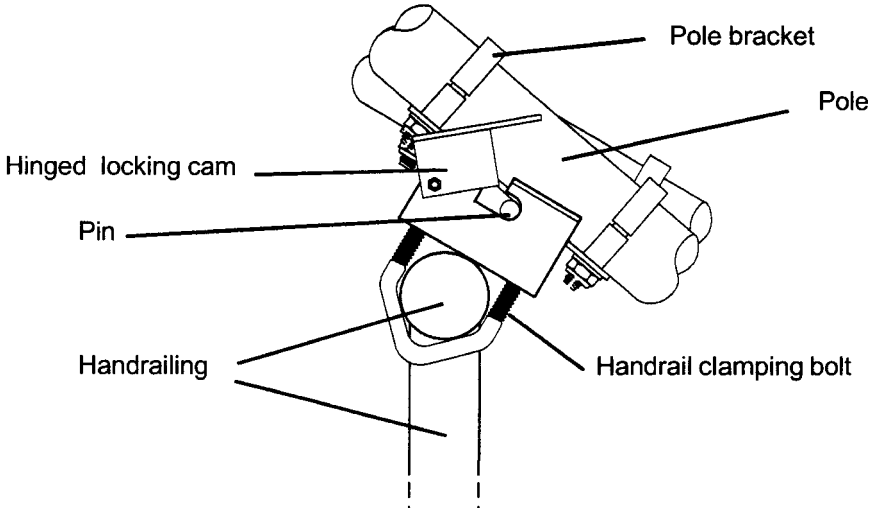


Figure 10 - Drawing of a mounting bracket demonstrating the pivoting action by showing the pole in two positions.

Mounting

The optional bracket, described and shown above, allows the probe assembly to be secured to a handrail by means of an extension pole. Handrail strength must be sufficient for both the original purpose and the additional loading imposed by the DO Probe Assembly.

If the probe is not to be mounted on a handrail, please seek advice from Severn Trent Services.

Bracket installation will require the use of a 17mm A/F deep socket wrench (spanner).

To ensure correct operation of the hinged locking cams, they must move freely without sticking or binding. Adjustment of the M6 securing nuts may be necessary.

The bracket is fitted using two “V” bolts around the handrail section. The orientation is important. The bracket mounts with the hinged locking cams on the top site of the bracket nearest to the installer. This is to ensure that the two pins on the pole bracket will drop into the slots and slide under gravity. The locking cams prevent the pins moving back up the slots and disengaging from the bracket.

For systems using a pole and shroud rather than a floating ball the bracket will need to be rotated on the handrail to ensure that the pole of the wet end is supported at an appropriate angle.

For floating ball installations, the bracket should be rotated such that the pole can move up and down with the ball movement without fouling on the fixed part of the bracket.

Attitude

Installation and location of the bracket and support pole must ensure free vertical movement of the support arm as previously mentioned.

The length of the support pole plus the point of bracket fixture must ensure that:

a) The vertical axis of the wet end assembly is 20 to 30 degrees from true vertical to prevent air pockets developing near the DO sensor, which can result in false measurements being made.

b) The base of a wet end assembly is in full contact with the process liquor and is submerged 200mm. Please contact **Severn Trent Services** for advice on other depths of immersion, (for instance, complete immersion of the cylinder and shroud for local environmental reasons).

Minor changes to support pole length are made by adjusting the clamping position of the bracket on the support arm. Care should be taken that such adjustments do not result in restriction of walkway access.

For the DO Makareth type wet-end assembly the support pole is maintained at a static pressure of 200mm of Water dependant on immersion depth and must not be cut after installation. Pressure seal integrity may be affected if the length of the support arm is changed by unauthorised means. This would compromise calibrations.

5.4.3 Support Pole

The wet end assembly support pole normally consists of one straight length of ABS pipe and ABS pipe fittings.

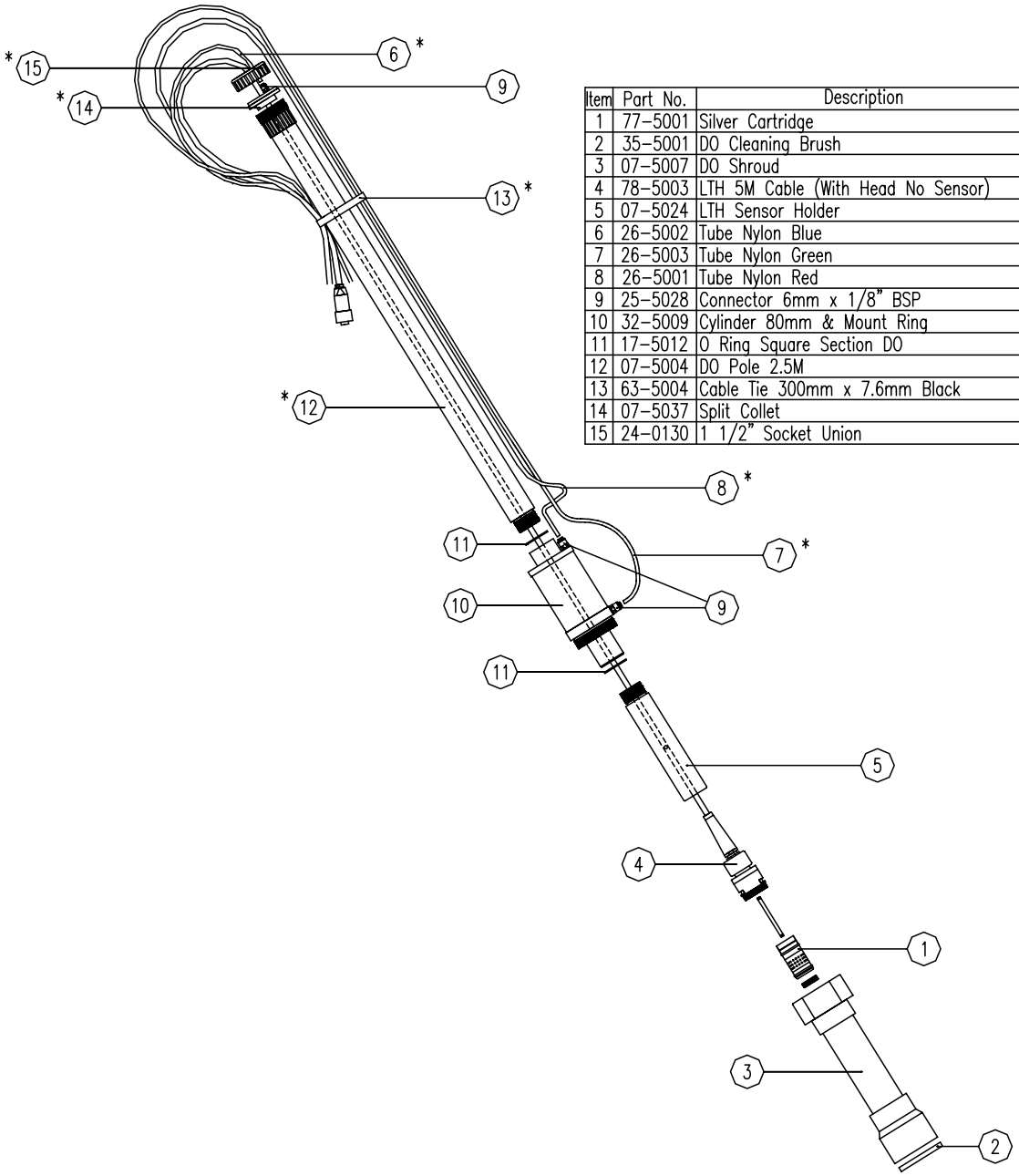
The length of the straight pipe is often tailored to suit local requirements established at time of order. To avoid excessive flexing of the support pole it is recommended that the straight pipe length should not exceed 3.0 metres.

5.4.4 Types of DO wet end Assembly

The DO wet end assembly will be one of two types:

- Makareth cell wet-end assembly
- Clark cell wet-end assembly

The installation of both types is described in detail beginning overleaf.



Item	Part No.	Description
1	77-5001	Silver Cartridge
2	35-5001	DO Cleaning Brush
3	07-5007	DO Shroud
4	78-5003	LTH 5M Cable (With Head No Sensor)
5	07-5024	LTH Sensor Holder
6	26-5002	Tube Nylon Blue
7	26-5003	Tube Nylon Green
8	26-5001	Tube Nylon Red
9	25-5028	Connector 6mm x 1/8" BSP
10	32-5009	Cylinder 80mm & Mount Ring
11	17-5012	O Ring Square Section DO
12	07-5004	DO Pole 2.5M
13	63-5004	Cable Tie 300mm x 7.6mm Black
14	07-5037	Split Collet
15	24-0130	1 1/2" Socket Union

Figure 11 - Diagram of Makareth DO Wet End Assembly

* Optional Extras

5.5 Assembly of *Makareth* DO wet end

The wet-end assembly is supplied in kit form and consists of:

- A plastic ABS pole (optional)
- A pneumatic cylinder and two black moulded 'O' rings to fit in the piston rod faces
- A sensor extension
- A sensor mounting head and cable
- A *Makareth* DO cell
- A calibration/cleaning shroud/ball
- A cable sealing collet (optional)
- Assembly instructions
- Pneumatic tubing (optional)

Assembly of the wet-end should be carried out as follows:

5.5.1 Fitting the pneumatic cylinder to the plastic [ABS] pole

Remove the cylinder from the protective bag. Screw it onto the thread on the pole ensuring that the seal is in place in the groove of the piston rod and that the white threaded ring is furthest from the pole and that the push fit fittings are in place.

☞ Use firm hand tight force – DO NOT USE TOOLS

5.5.2 Fitting the sensor extension to the pole assembly

Remove the DO Sensor extension tube from the fitting pack. Keep the cable ties for later use. Remove the thread protection cap. Ensure that the second black seal is in place. Fit the extension tube into the cylinder (previously fitted to the pole) ensuring that the threads are not crossed and the "O" ring makes the correct seal.

☞ Use firm hand tight force – DO NOT USE TOOLS

5.5.3 Fitting the sensor head and cable to the sensor extension

Before proceeding, it is necessary to remove the split collet at the top of the pole by unscrewing the clamping ring and removing the two halves. Put the collet in a safe place and refit the clamping ring.

The sensor head is a black plastic component attached to 5 meters of cable fitted with a multi pin plug. Feed the cable up the pole until the sensor head engages with the sensor extension. The sensor head should be secured using the two M3 grub screws in the side of the extension.

5.5.4 Fitting the *Makareth* DO Cell

The *Makareth* DO cell is supplied in a cell storage holder that contains a solution of sodium sulphite. This ensures that the membrane remains wet and in good condition. The membrane is delicate and may be damaged by careless use. Inspect the electrode for signs of membrane damage and replace it if necessary.

WARNING

The Makareth cell is like a battery, slowly running down as it measures oxygen. It is supplied stored in an oxygen-absorbing solution and should be kept in the solution when not in use. This is a 3-10% w/v solution of sodium sulphite in water. Although only small quantities are involved, this is a potentially hazardous chemical and must be handled appropriately. Please refer to the example **MSDS** in **Part 2 - Safety** for further information.

The cell needs to be removed from the storage holder and attached to the DO sensor head on the wet-end as follows:

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(i) Removing the *Makareth* DO cell from its holder

- Unscrew the end cap of the cell storage holder taking care not to spill the solution inside.
- Take care not to allow contact between the holder and the DO cell.
- Hold the end cap in one hand and unscrew the knurled nut.
- Whilst holding the end cap in one hand grasp the cell with the other hand and firmly pull it away from the end cap.
- Place the cell on a smooth surface.
- Unscrew the rod protruding from the end cap.
- Screw the end cap back on the storage holder and put it in a safe place in case you need to return the cell for refurbishment.

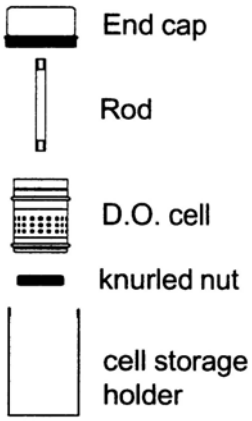


Figure 12 - Makareth cell and storage holder

(ii) Fitting the *Makareth* DO cell to the sensor head

- Carefully screw the rod into the bottom of the sensor head.
- Carefully slide the cell onto the rod, align the contact pins and push firmly home.
- Screw the knurled nut onto the bottom of the cell.
- Finally, inspect the membrane for damage and refer to the manufacturer's instructions if necessary.

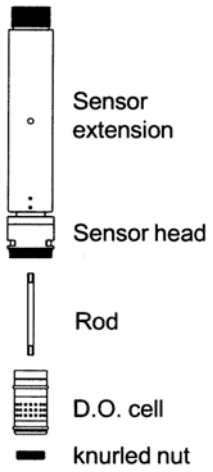


Figure 13 - Diagram showing the fitting of Makareth DO cell

5.5.5 Fitting the calibration shroud/ball

The calibration shroud or ball is supplied with a cleaning brush fitted in the bell mouth. The brush is located in a groove, is secured by its own spring pressure, and can easily be removed by hand if necessary.

Slide the shroud or ball over the sensor assembly taking great care to avoid contact with the cell membrane. Ensure that the 'O' ring seal is against the pneumatic cylinder and tighten the clamping ring by hand.

Use firm hand tight force. Do not use tools

In order to protect the ***Makareth*** DO cell when handling the probe push the pneumatic cylinder down by hand so that the sensor is inside the calibration shroud/ball.

5.5.6 Connecting the pneumatic tubes

Please refer to the pneumatic connection diagrams…

Figure 6 – Local Control box – Front view showing buttons
Figure 7 – Local control box – view of base showing connectors
Figure 18 - Main System Assembly showing external connections

The colour-coded pneumatic tubes are fitted into the push fit connectors as shown in Figure 11 - Diagram of Makareth DO Wet End Assembly, after first removing the blanking plugs

Red	-	moves the sensor into the process
Green	-	moves the sensor into the shroud
Blue	-	aerates probe for calibration

The green and red tubes must be fitted so that there is sufficient slack to allow free movement of the pneumatic cylinder.

5.5.7 Sealing the pole (Makareth wet end only)

The probe must be sealed in order that the calibration air will reach the sensor. The calibration must pressurise the pole to the same pressure as that exerted by the hydrostatic head at the depth of immersion in order to displace the process liquor and calibrate the sensor. Any leaks will prevent calibration from taking place. Sealing is achieved using a split collet around the cable as follows:

Apply a liberal coat of silicone rubber to the collet to maintain an effective seal. Secure the collet using the clamping ring on top of the pole. Wipe away excess silicone rubber.

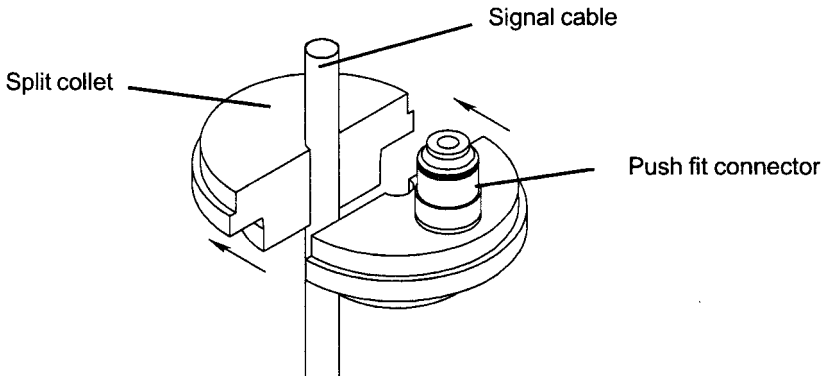


Figure 14 - Diagram of split collet for Makareth wet end

5.5.8 Securing the pneumatic blue tube and the sensor cable

Loop the sensor cable and blue pneumatic tubes to the top of the pole using a cable tie (see Figure 11 - Diagram of Makareth DO Wet End Assembly). This will prevent any unnecessary stress on the cable and tube.

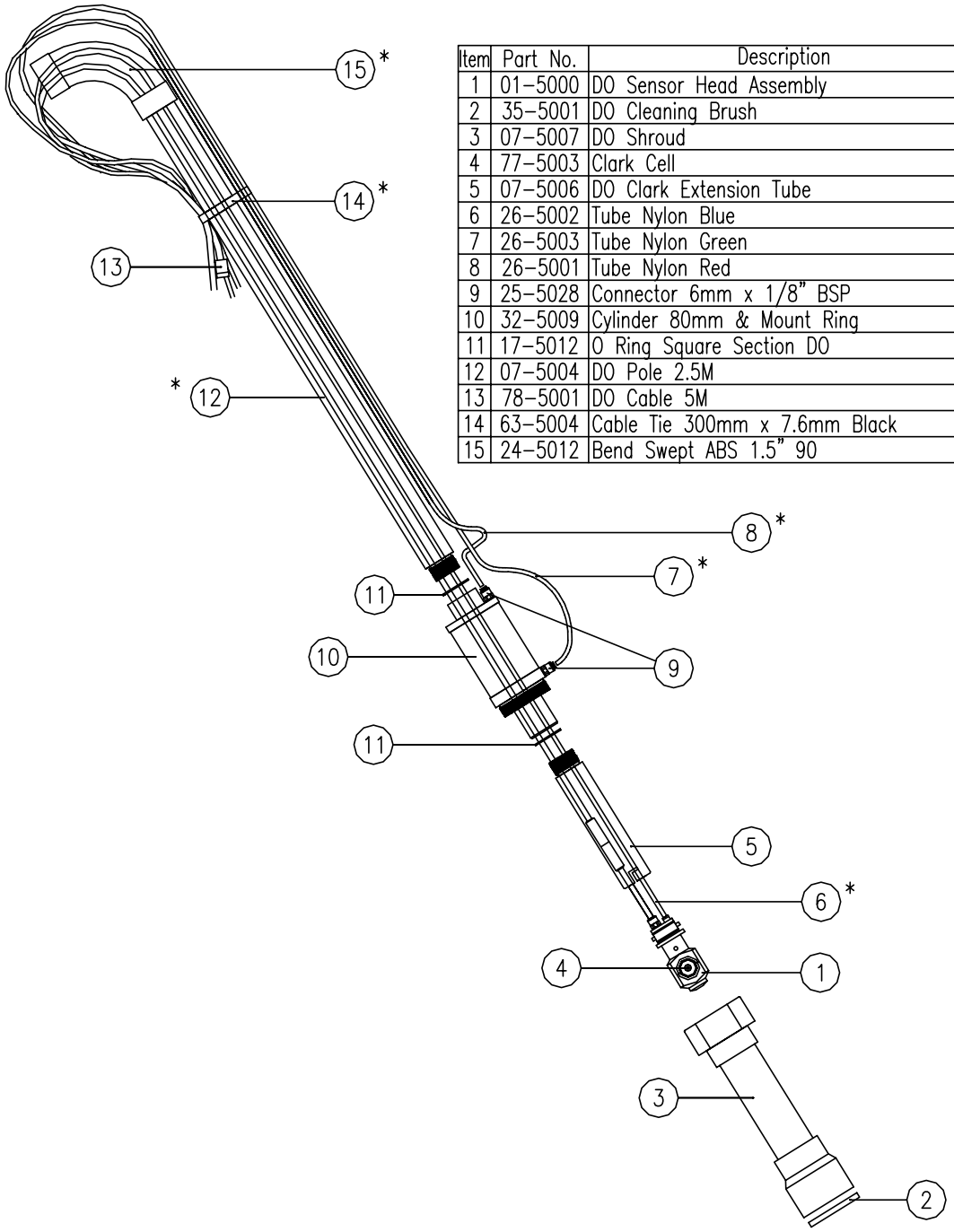
5.5.9 Air Supply

Two air-supply options are available:

(i) A self-contained compressor unit
(ii) Site air supply

For option (i) no further tube connections are necessary as the instrument is pre-assembled and tested.

For option (ii) a local site dry air supply rated at 2.0 bar should be used.



Item	Part No.	Description
1	01-5000	DO Sensor Head Assembly
2	35-5001	DO Cleaning Brush
3	07-5007	DO Shroud
4	77-5003	Clark Cell
5	07-5006	DO Clark Extension Tube
6	26-5002	Tube Nylon Blue
7	26-5003	Tube Nylon Green
8	26-5001	Tube Nylon Red
9	25-5028	Connector 6mm x 1/8" BSP
10	32-5009	Cylinder 80mm & Mount Ring
11	17-5012	O Ring Square Section DO
12	07-5004	DO Pole 2.5M
13	78-5001	DO Cable 5M
14	63-5004	Cable Tie 300mm x 7.6mm Black
15	24-5012	Bend Swept ABS 1.5" 90

Figure 15 – Diagram of Clark cell DO Wet End Assembly

* Optional Extras

5.6 Assembly of *Clark* DO wet end

The wet-end assembly is supplied in a kit form and consists of:

- A plastic (ABS) pole and swept bend (optional)
- A pneumatic cylinder and two black moulded 'O' rings to fit in the piston rod end faces
- A sensor extension tube
- A sensor head and cable connector
- A *Clark* DO cell (packaged) and retaining ring key
- A calibration/cleaning shroud/ball
- Assembly instructions
- Pneumatic tubing (optional)

Assembly of the wet-end should be carried out as per the kits enclosed assembly instructions, which are summarised below and overleaf.

5.6.1 Fitting the pneumatic cylinder to the plastic (ABS) pole

Remove the cylinder from the protective bag. Screw it onto the thread on the pole ensuring that the seal is in place in the groove of the piston rod and that the white threaded ring is furthest from the pole and that the push fit fittings are in place.

☞	Use firm hand tight force – DO NOT USE TOOLS

5.6.2 Fitting the sensor extension to the pole assembly

Remove the DO sensor extension tube from the fitting pack. Keep the cable ties for later use. Remove the thread protection cap. Ensure that the second black seal is in place. Fit the extension rube into the cylinder (previously fitted to pole) ensuring that the threads are not crossed and the 'O' ring makes the correct seal.

☞	Use firm hand tight force – DO NOT USE TOOLS

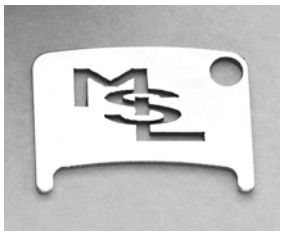
5.6.3 Fitting the sensor head and cable to the sensor extension

The sensor head is a plastic component fitted with a multi-pin plug for connecting to the 5-metre long extension cable. Lubricate the "O" rings with silicone grease. Feed the cable up the pole ensuring that it does not become twisted with the blue pneumatic tube inside the pole. Connect the blue pneumatic line from inside the pole to the push fit connector on the sensor head (see section 3.5 for instructions

on these connectors). Screw the in-line cable connectors together. Push and twist the sensor head into the bayonet fixture.

5.6.4 Fitting the *Clark* type cell

Remove the retaining ring from the sensor head using the special tool provided (illustrated right).



Unpack the new *Clark* DO cell and install it into the sensor head, ensuring that it locates into its mating parts correctly. The cell block is coated in silicone grease to repel moisture. Do not remove this grease.

Figure 16 - Clark DO cell retaining ring key

Taking care not to damage the cell membrane or transfer any silicone grease onto the membrane, screw the retaining ring over the cell

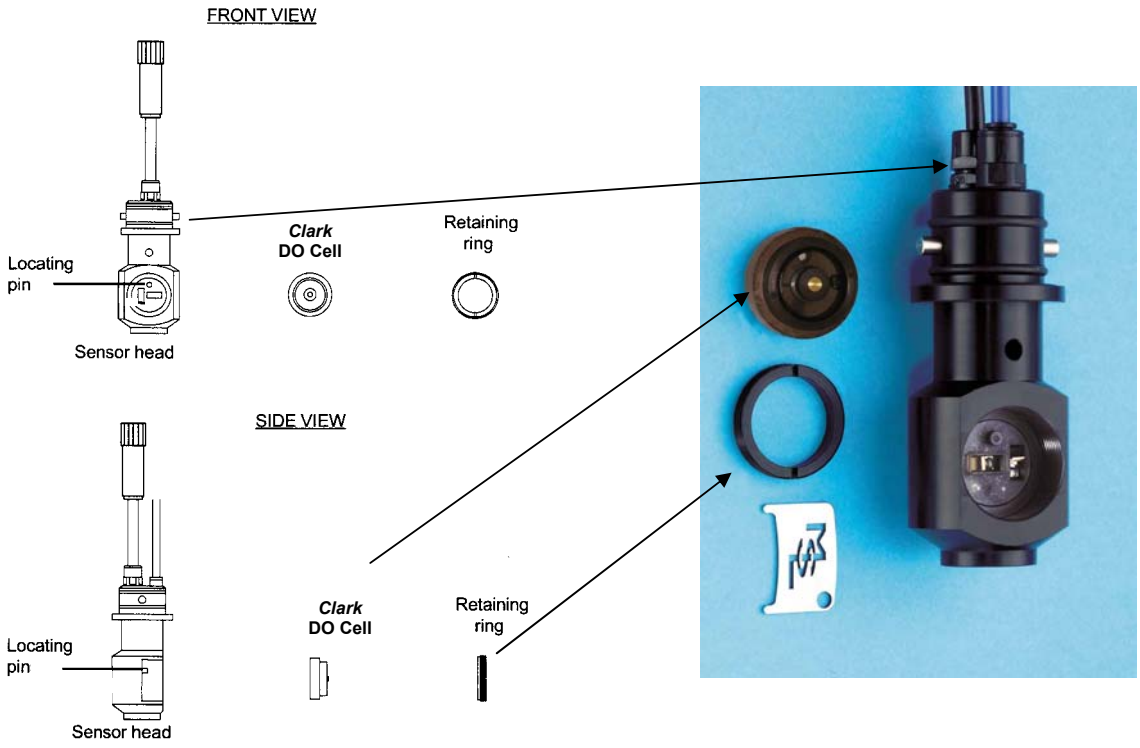


Figure 17 - Illustrations showing the fitting of the Clark DO cell

5.6.5 Fitting the calibration shroud/ball

The calibration shroud or ball is supplied with a cleaning brush fitted in the bell mouth. The brush is located in a groove and is secured by its own spring pressure and can easily be removed by hand if necessary.

Slide the shroud or ball over the sensor assembly taking great care to avoid contact with the cell membrane. Ensure that the "O" ring seal is against the pneumatic cylinder and tighten the clamping ring by hand.

☞	Use firm hand tight force. Do not use tools

In order to protect the *Clark* DO cell when handling the probe push the pneumatic cylinder down by hand so that the sensor is inside the calibration shroud.

5.6.6 Connecting the pneumatic tubes

Please refer to the pneumatic connection diagrams on pages 18, 29 and 36. The colour coded pneumatic tubes are fitted into the push fit connectors as shown in the diagram, after first removing the blanking plugs.

Red	-	Moves the sensor into the process
Green	-	Moves the sensor into the shroud
Blue	-	Aerates probe for calibration

The green and red tubes must be fitted so that there is sufficient slack to allow free movement of the pneumatic cylinder.

5.6.7 Air Supply

Two air supply options are available:

(i) Self-contained compressor unit
(ii) Site air supply

For option (i) no further tube connections are necessary as the instrument is pre-assembled and tested.

For option (ii) a local site dry air supply rated 2.0 bar should be used.

5.6.8 Fitting the plastic 90° Bend

The 90° bend should now be fitted. Remove the bend from the fitting kit. Thread the blue pneumatic tube and signal cable through the bend and push the bend onto the pole ensuring that when the pole is fitted the bend faces down for weather protection.

For systems supplied without a pre-wired back panel or compressor, please refer to fig.21 page 45, fig.22 page 47 or fig.23 page 49

5.7 Wiring Details

5.7.1 Power Connections

The operating voltage of the ***AZTEC DO System*** is readily confirmed from the label attached to the equipment and will normally be either 110 Volt AC or 230 Volt AC.
To allow for correct labelling during manufacture, and selection of the appropriate compressor option if required, the operating voltage must be stated at the time of order. The power supply must comply with the following requirements.

115 or 230Va.c.@50/60 Hz (+/- 10%)

The main incoming power supply cable is terminated as indicated. It is recommended that the incoming power supply cable is armoured and should be glanded using first quality brass glands fitted with locknuts, earth tag and PVC over-shroud. Final cable termination is at the terminal provided at the isolator feed side.

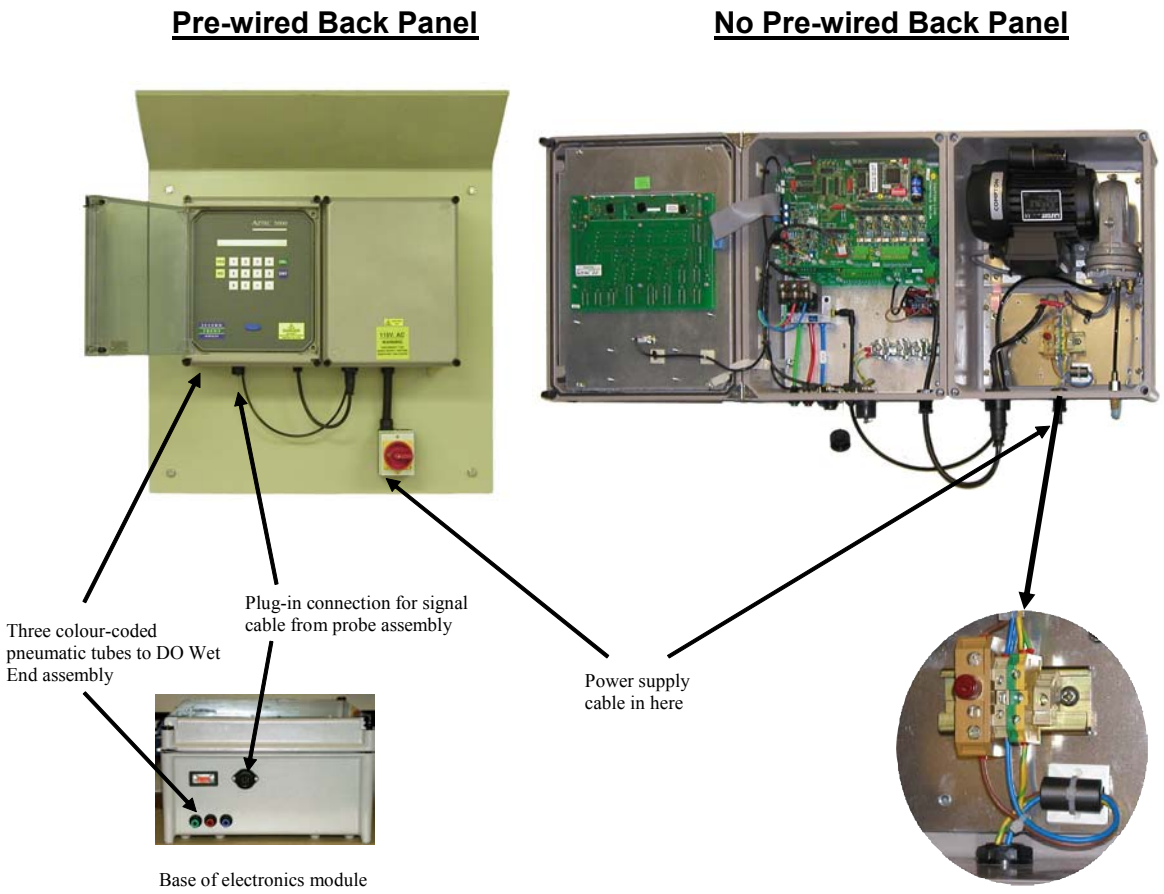
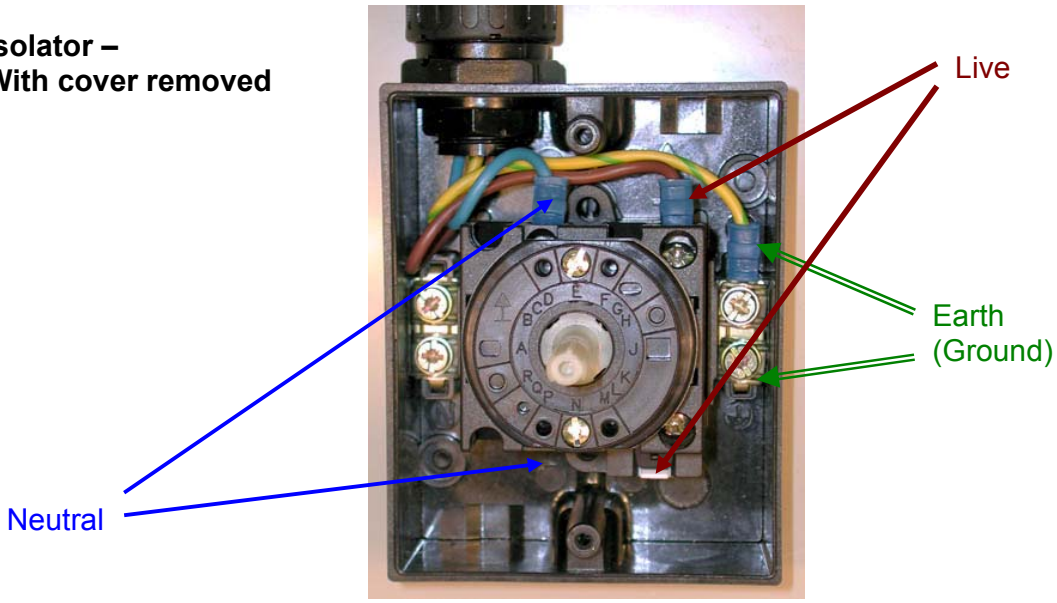

Pre-wired Back Panel
No Pre-wired Back Panel
Three colour-coded pneumatic tubes to DO Wet End assembly
Plug-in connection for signal cable from probe assembly
Power supply cable in here
Base of electronics module

Figure 18 - Main System Assembly showing external connections

Mains (line) isolator …

Isolator –
With cover removed



Isolator (Off)
With cover fitted

Figure 19 - Diagram showing mains (line) power connectors

5.7.2 Main System Assembly and Local Control Box interconnections

This sub-section applies to double units and single with a remote probe with a LCB

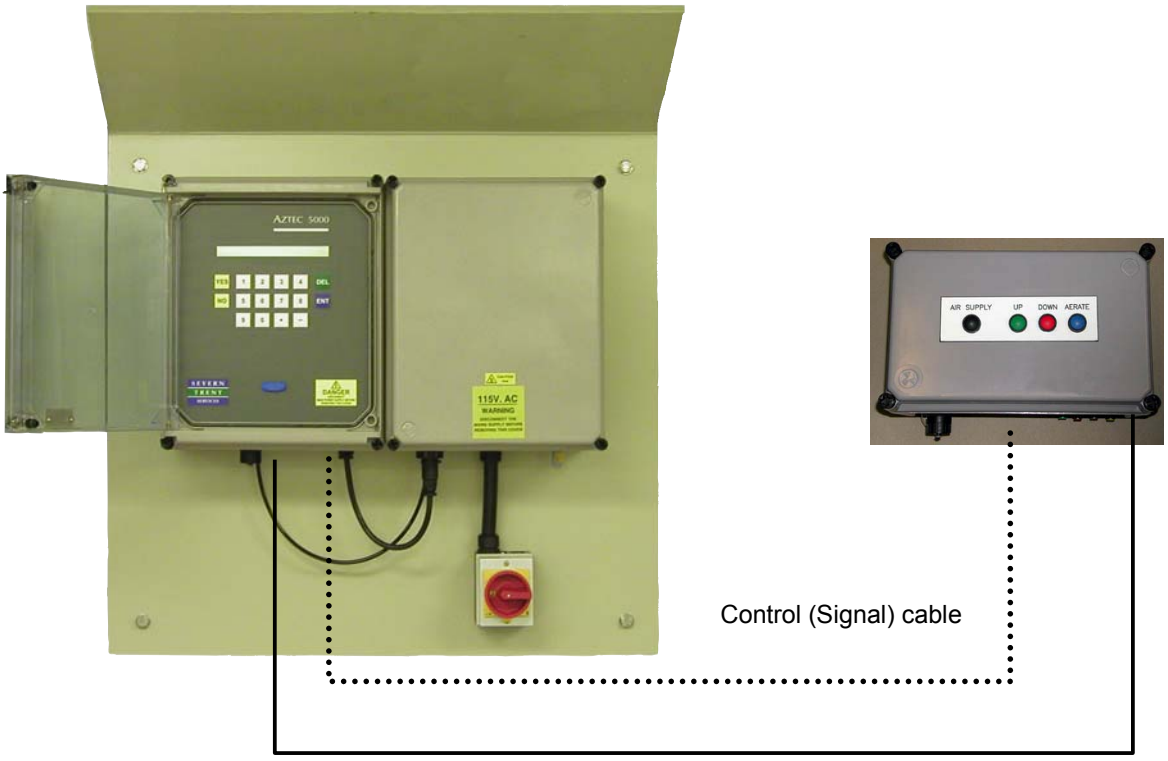


Figure 20 - Diagram showing control (signal) cable between Main System Assembly and Local Control Box

Electrical: There are no mains supply connectors for the local control box.

The signals from the sensor are connected via a pre-wired multi-way plug and socket.

The link between the electronics module and the Local Control Box requires a 12-core screened cable connected to the terminals, and the screen itself connected to the chassis plate.

The cable recommended for the control (signal) cable is:

16/0.2 mm (0.5mm^2), 12-core with overall tinned copper braided sheath and PVC outer. R.S. Components PLC part Number 367-757, alternatively, Belden Type 9261 12 core cable or equivalent. See section 5.7.3 for details of the terminal connections.

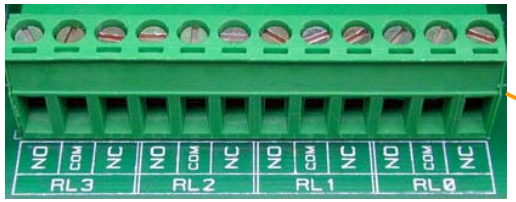
IMPORTANT NOTE

The digital I/O is powered internally by the instrument. It has been observed that some Consulting Engineers have specified surge arrestors in the cabling associated with the Local Control Box.

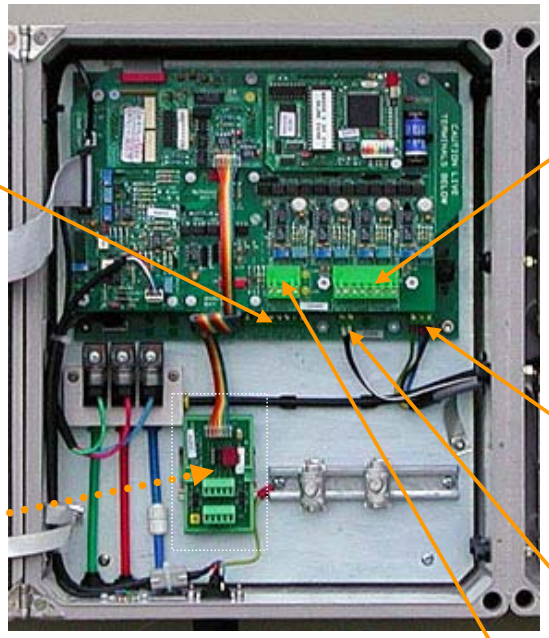
The power supply design of these instruments is such that the “Common” digital I/O supply line is (NEGATIVE or MINUS) 24VDC with respect to the system 0V and each digital output is individually held to 0V when the output is active.

THIS SHOULD BE TAKEN INTO ACCOUNT WHEN SPECIFYING ANY ANCILLARY EQUIPMENT TO BE ATTACHED TO THIS INSTRUMENT, NOT EXPLICITLY SPECIFIED IN THIS MANUAL.

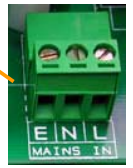
Figure 21 - 5.7.3. (i) Terminal designations for single DO instrument (with & without optional comms)



Main I/O Terminal	Function	Comments
RL0 NC	Alarm 1 - normally closed	Volt-free contacts
RL0 COM	Alarm 1 - common	Volt-free contacts
RL0 NO	Alarm 1 - normally open	Volt-free contacts
RL1 NC	Alarm 2 - normally closed	Volt-free contacts
RL1 COM	Alarm 2 - common	Volt-free contacts
RL1 NO	Alarm 2 - normally open	Volt-free contacts
RL2 NC	Alarm 3 - normally closed	Volt-free contacts
RL2 COM	Alarm 3 - common	Volt-free contacts
RL2 NO	Alarm 3 - normally open	Volt-free contacts
RL3 NC	Alarm 4 - normally closed	Volt-free contacts
RL3 COM	Alarm 4 - common	Volt-free contacts
RL3 NO	Alarm 4 - normally open	Volt-free contacts



Terminal	Function
Analogue Output – 0 +	Analogue Output 1 +ve
Analogue Output – 0 -	Analogue Output 1 -ve
Analogue Output – 1 +	Analogue Output 2 +ve
Analogue Output – 1 -	Analogue Output 2 -ve
Analogue Output – 2 +	Analogue Output 3 +ve
Analogue Output – 2 -	Analogue Output 3 -ve
Analogue Output – 3 +	Analogue Output 4 +ve
Analogue Output – 3 -	Analogue Output 4 -ve



Terminal	Function
Mains in E	Mains (Line) supply Earth
Mains in N	Mains (Line) supply Neutral
Mains in L	Mains (Line) supply Live

Terminal	Function
SSR + & SSR -	Compressor supply control

(These terminals are Pre-wired on units with integral compressor)

Terminal	Function
Dig in – 0+	Calibration request +24V
Dig in – 0-	Calibration request 0V
Dig in – 1+	Uncommitted
Dig in – 1-	Uncommitted

With optional COMMS

CN1 and CN2 are provided to accept incoming and outgoing multidrop communications cable wire tails to avoid the practice of wiring two tails into one terminal.

The terminals are electrically connected by function to their corresponding 'partners'.

Comms I/O Terminal	Function
CN1 Tx-	RS422 transmit -ve
CN1 Tx+	RS422 transmit +ve
CN1 Rx-	RS422 receive -ve
CN1 Rx+	RS422 receive +ve
CN1 0V	RS422 signal grnd
CN2 Tx-	RS422 transmit -ve
CN2 Tx+	RS422 transmit +ve
CN2 Rx-	RS422 receive -ve
CN2 Rx+	RS422 receive +ve
CN2 0V	RS422 signal grnd

[Spacer page]

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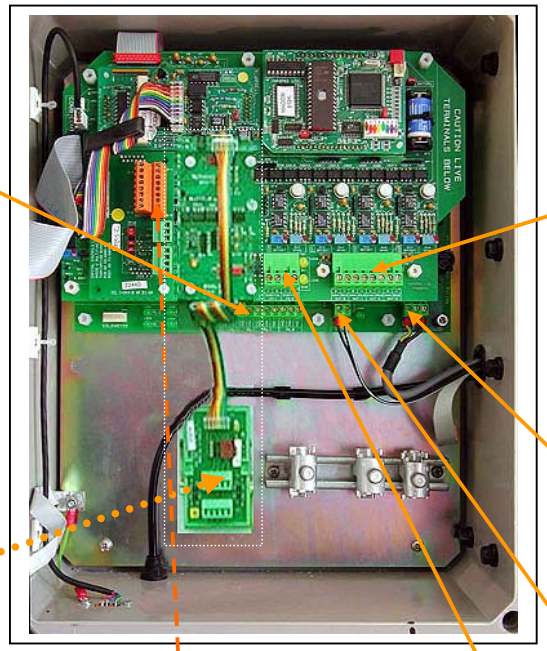
Figure 22 - 5.7.3. (ii) Terminal designations for single DO with a Local Control Box (shown overleaf)

Main I/O Terminal	Function	Comments
RL0 NC	Alarm 1 – normally closed	Volt-free contacts
RL0 COM	Alarm 1 – common	Volt-free contacts
RL0 NO	Alarm 1 – normally open	Volt-free contacts
RL1 NC	Alarm 2 – normally closed	Volt-free contacts
RL1 COM	Alarm 2 – common	Volt-free contacts
RL1 NO	Alarm 2 – normally open	Volt-free contacts
RL2 NC	Alarm 3 – normally closed	Volt-free contacts
RL2 COM	Alarm 3 – common	Volt-free contacts
RL2 NO	Alarm 3 – normally open	Volt-free contacts
RL3 NC	Alarm 4 – normally closed	Volt-free contacts
RL3 COM	Alarm 4 – common	Volt-free contacts
RL3 NO	Alarm 4 – normally open	Volt-free contacts



Terminal	Function
Analogue Output – 0 +	Analogue Output 1 +ve
Analogue Output – 0 -	Analogue Output 1 -ve
Analogue Output – 1 +	Analogue Output 2 +ve
Analogue Output – 1 -	Analogue Output 2 -ve
Analogue Output – 2 +	Analogue Output 3 +ve
Analogue Output – 2 -	Analogue Output 3 -ve
Analogue Output – 3 +	Analogue Output 4 +ve
Analogue Output – 3 -	Analogue Output 4 -ve

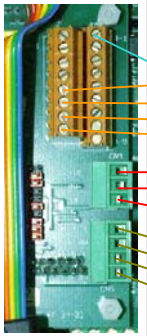
Terminal	Function
Mains in E	Mains (Line) supply Earth
Mains in N	Mains (Line) supply Neutral
Mains in L	Mains (Line) supply Live

With optional COMMS

CN1 and CN2 are provided to accept incoming and outgoing multidrop communications cable wire tails to avoid the practice of wiring two tails into one terminal.

The terminals are electrically connected by function to their corresponding 'partners'.

Comms I/O Terminal	Function
CN1 Tx-	RS422 transmit -ve
CN1 Tx+	RS422 transmit +ve
CN1 Rx-	RS422 receive -ve
CN1 Rx+	RS422 receive +ve
CN1 0V	RS422 signal grnd
CN2 Tx-	RS422 transmit -ve
CN2 Tx+	RS422 transmit +ve
CN2 Rx-	RS422 receive -ve
CN2 Rx+	RS422 receive +ve
CN2 0V	RS422 signal grnd



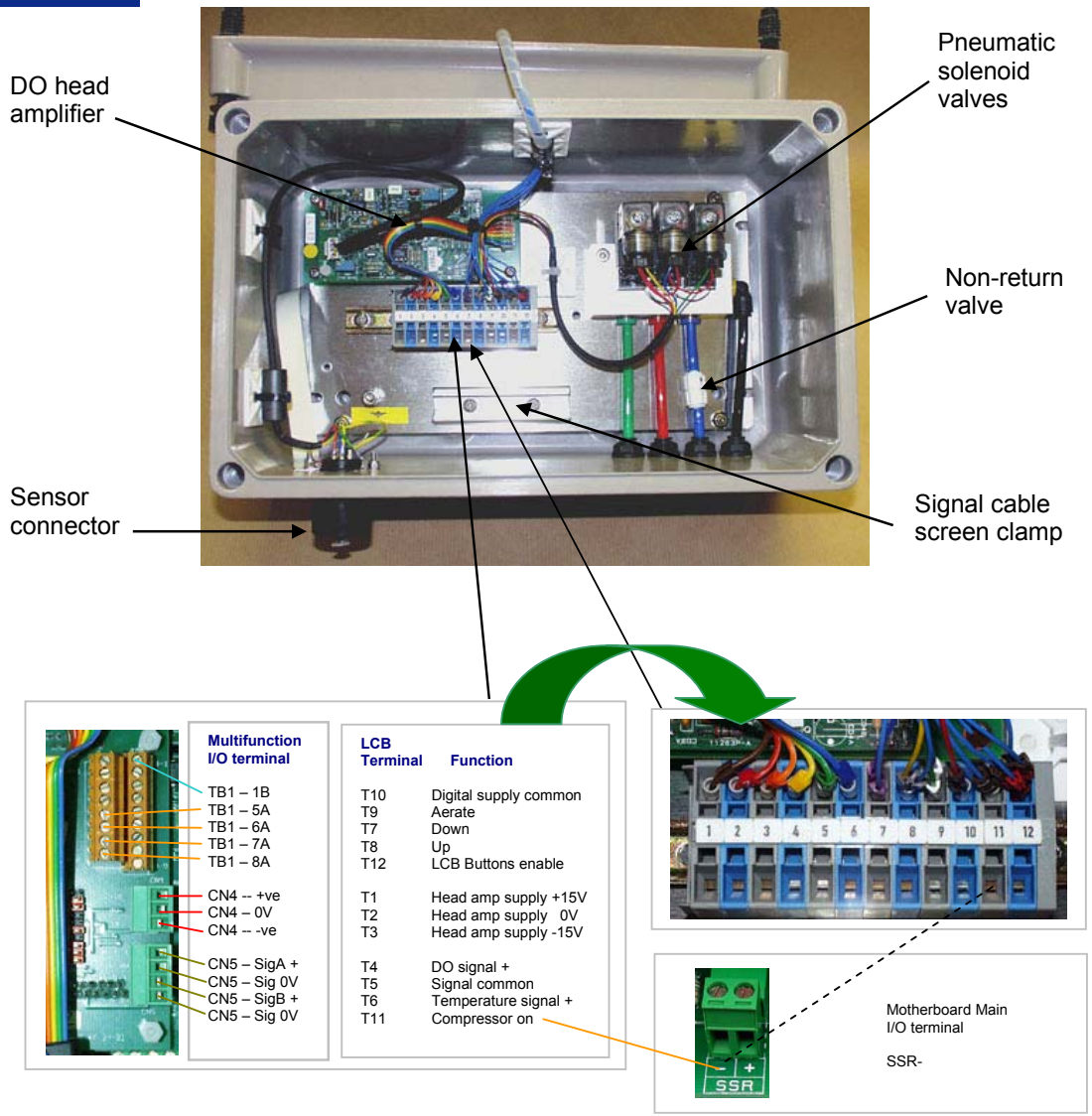
Multifunction I/O terminal
TB1 – 1B
TB1 – 5A
TB1 – 6A
TB1 – 7A
TB1 – 8A
CN4 -- +ve
CN4 – 0V
CN4 -- -ve
CN5 – SigA +
CN5 – Sig 0V
CN5 – SigB +
CN5 – Sig 0V

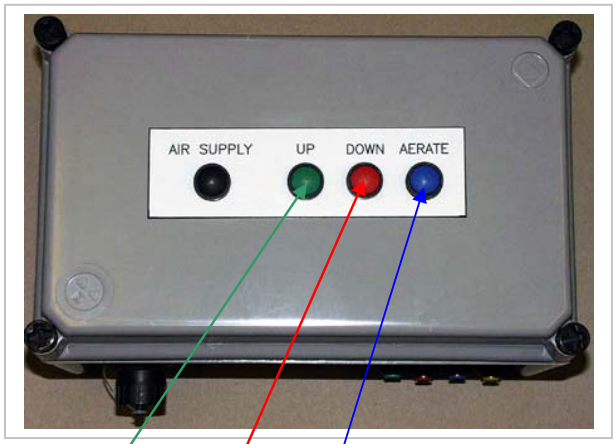
LCB Terminal	Function
T10	Digital supply common
T9	Aerate
T7	Down
T8	Up
T12	LCB Buttons enable
T1	Head amp supply +15V
T2	Head amp supply 0V
T3	Head amp supply -15V
T4	DO signal +
T5	Signal common
T6	Temperature signal +
--	No connection

Main I/O Terminal	LCB Terminal	Function
SSR +	N/C	Compr. supply control
SSR -	T11*	Compr. supply control

(* Shares terminal with wiring to integral compressor)

Terminal	Function
Dig in – 0+	Calib request +24V
Dig in – 0-	Calib request 0V
Dig in – 1+	Uncommitted
Dig in – 1-	Uncommitted





UP (Green) **DOWN** (Red) **AERATE** (Blue) **AIR** (from main assembly)

Multifunction I/O terminal

TB1 – 1B
TB1 – 5A
TB1 – 6A
TB1 – 7A
TB1 – 8A

CN4 -- +ve
CN4 – 0V
CN4 -- -ve

CN5 – SigA +
CN5 – Sig 0V
CN5 – SigB +
CN5 – Sig 0V

LCB Terminal	Function
T10	Digital supply common
T9	Aerate
T7	Down
T8	Up
T12	LCB Buttons enable
T1	Head amp supply +15V
T2	Head amp supply 0V
T3	Head amp supply -15V
T4	DO signal +
T5	Signal common
T6	Temperature signal +
T11	Compressor on

Motherboard Main I/O terminal

SSR-

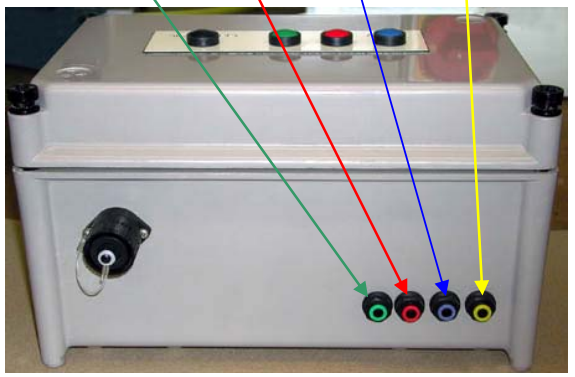
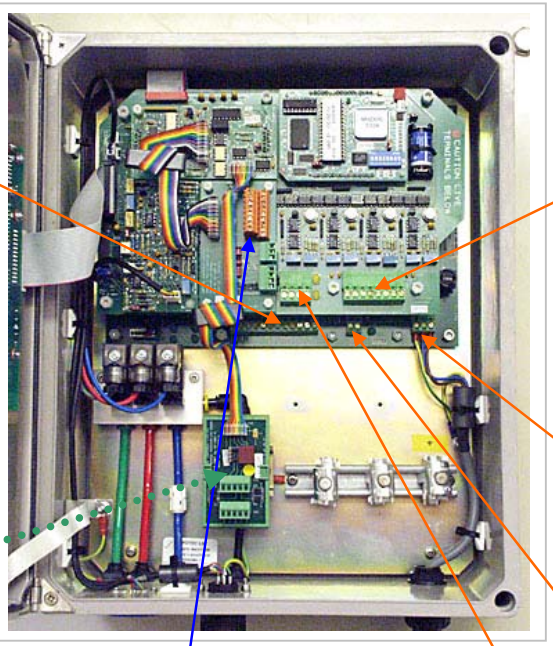


Figure 23 - 5.7.3. (iii) Terminal Designations for double DO instrument with LCB shown overleaf

Main I/O Terminal	Function	Comments
RL0 NC	Alarm 1 – normally closed	Volt-free contacts
RL0 COM	Alarm 1 – common	Volt-free contacts
RL0 NO	Alarm 1 – normally open	Volt-free contacts
RL1 NC	Alarm 2 – normally closed	Volt-free contacts
RL1 COM	Alarm 2 – common	Volt-free contacts
RL1 NO	Alarm 2 – normally open	Volt-free contacts
RL2 NC	Alarm 3 – normally closed	Volt-free contacts
RL2 COM	Alarm 3 – common	Volt-free contacts
RL2 NO	Alarm 3 – normally open	Volt-free contacts
RL3 NC	Alarm 4 – normally closed	Volt-free contacts
RL3 COM	Alarm 4 – common	Volt-free contacts
RL3 NO	Alarm 4 – normally open	Volt-free contacts



Terminal	Function
Analogue Output – 0 +	Analogue output 1 +ve
Analogue Output – 0 -	Analogue output 1 -ve
Analogue Output – 1 +	Analogue output 2 +ve
Analogue Output – 1 -	Analogue output 2 -ve
Analogue Output – 2 +	Analogue output 3 +ve
Analogue Output – 2 -	Analogue output 3 -ve
Analogue Output – 3 +	Analogue output 4 +ve
Analogue Output – 3 -	Analogue output 4 -ve

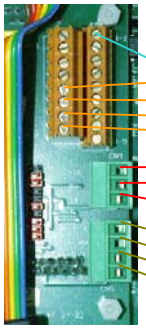
Terminal	Function
Mains in E	Mains (Line) supply Earth
Mains in N	Mains (Line) supply Neutral
Mains in L	Mains (Line) supply Live

With optional COMMS

CN1 and CN2 are provided to accept incoming and outgoing multidrop communications cable wire tails to avoid the practice of wiring two tails into one terminal.

The terminals are electrically connected by function to their corresponding 'partners'.

Comms I/O Terminal	Function
CN1 Tx-	RS422 transmit -ve
CN1 Tx+	RS422 transmit +ve
CN1 Rx-	RS422 receive -ve
CN1 Rx+	RS422 receive +ve
CN1 0V	RS422 signal grnd
CN2 Tx-	RS422 transmit -ve
CN2 Tx+	RS422 transmit +ve
CN2 Rx-	RS422 receive -ve
CN2 Rx+	RS422 receive +ve
CN2 0V	RS422 signal grnd

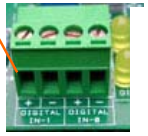


Multifunction I/O terminal
TB1 – 1B
TB1 – 5A
TB1 – 6A
TB1 – 7A
TB1 – 8A
CN4 -- +ve
CN4 – 0V
CN4 -- -ve
CN5 – SigA +
CN5 – Sig 0V
CN5 – SigB +
CN5 – Sig 0V

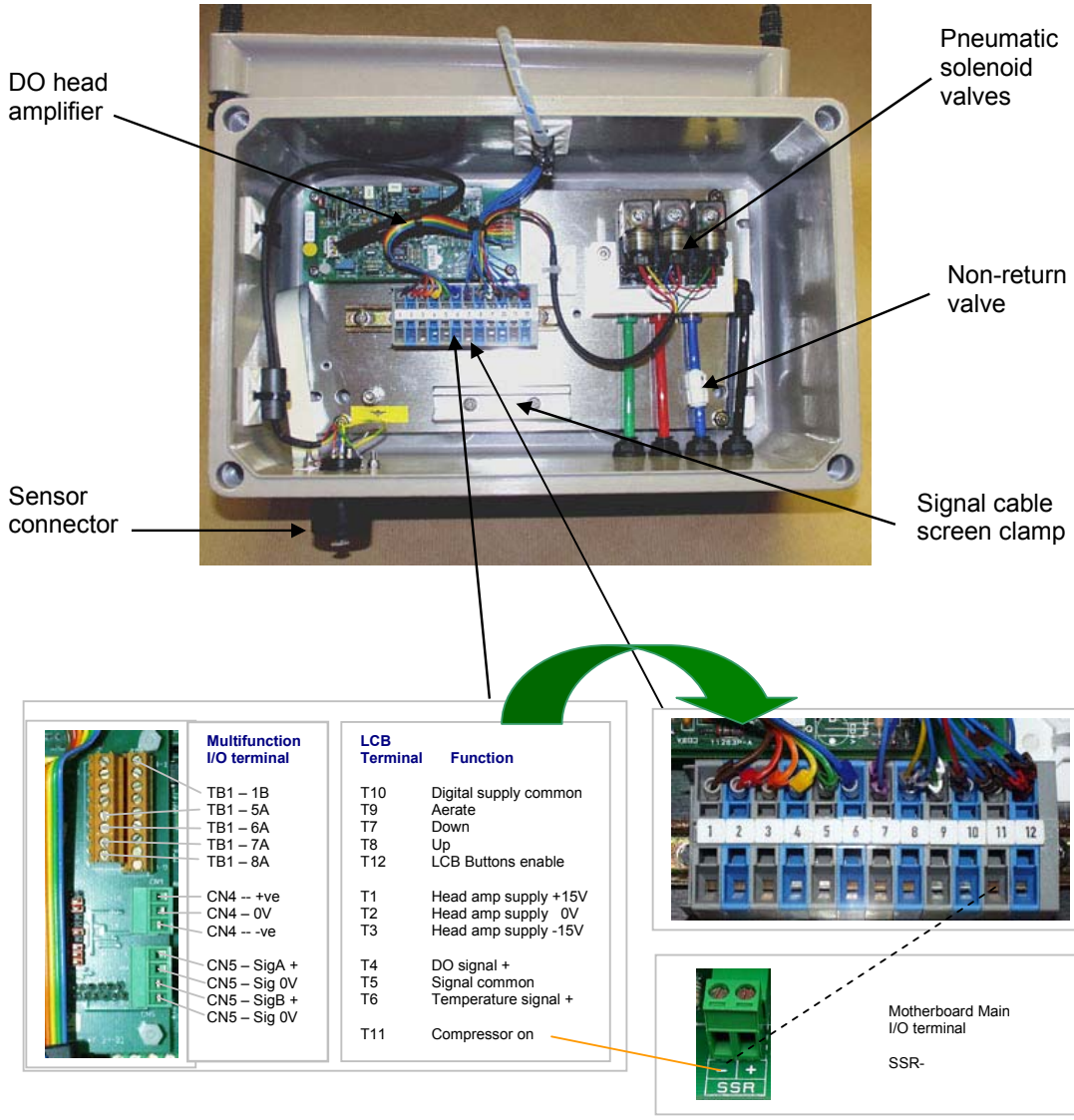
LCB Terminal	Function
T10	Digital supply common
T9	Aerate
T7	Down
T8	Up
T12	LCB Buttons enable
T1	Head amp supply +15V
T2	Head amp supply 0V
T3	Head amp supply -15V
T4	DO signal +
T5	Signal common
T6	Temperature signal +
--	No connection

Main I/O Terminal	LCB Terminal	Function
SSR +		Compressor supply control
SSR -	T11*	Compressor supply control

(* Shares terminal with wiring to integral compressor)



Terminal	Function
Dig in – 0+	Head 1 Calib request +24V
Dig in – 0-	Head 1 Calib request 0V
Dig in – 1+	Head 2 Calib request +24V
Dig in – 1-	Head 2 Calib request 0V


DO head amplifier
Pneumatic solenoid valves
Non-return valve
Sensor connector
Signal cable screen clamp
Multifunction I/O terminal
TB1 – 1B
TB1 – 5A
TB1 – 6A
TB1 – 7A
TB1 – 8A
CN4 -- +ve
CN4 – 0V
CN4 -- -ve
CN5 – SigA +
CN5 – Sig 0V
CN5 – SigB +
CN5 – Sig 0V
LCB Terminal Function
T10 Digital supply common
T9 Aerate
T7 Down
T8 Up
T12 LCB Buttons enable
T1 Head amp supply +15V
T2 Head amp supply 0V
T3 Head amp supply -15V
T4 DO signal +
T5 Signal common
T6 Temperature signal +
T11 Compressor on
Motherboard Main I/O terminal
SSR-
SSR
AIR SUPPLY
UP
DOWN
AERATE
UP (Green)
DOWN (Red)
AERATE (Blue)
AIR (from main assembly)

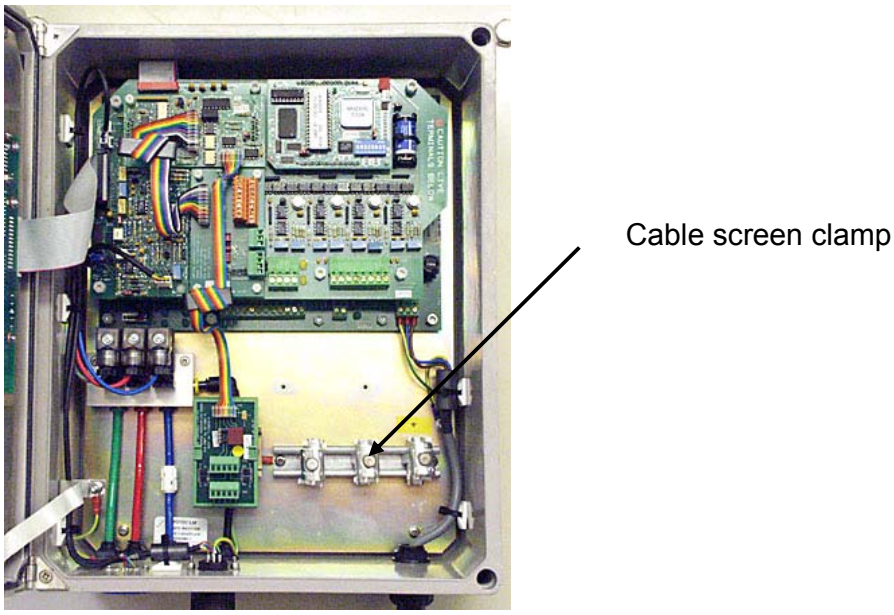


Figure 24 - Signal cable(s) screen termination detail

☞	**Signal cable screens must be clamped using the fitting supplied**

5.7.3 Sensor cable connection

The sensor cable connections are made into the main electronics module or the local control box as appropriate. The connection is by means of a pre-wired multi pole connector. The plug merely needs inserting into its mating socket and the retaining ring tightening up to prevent moisture ingress.

5.8 Pneumatics Connections

Connect the three pneumatic tubes between the Main System Assembly and the DO Probe Assembly. These are normally colour coded red, blue and green. Connection is achieved using push fit connectors. Please refer to the details given in Section 3.5 and Section 4 Technical Specification.

Pneumatic through-connectors are provided to allow ease of connection and disconnection of the DO probe pneumatic lines from the Main System Assembly.

If a local control box is to be installed, an extra push fit connector may be fitted to the bottom of the front panel interface box (see section 5.7.2). This is used to provide an air supply to the local control box. The air line should be 6mm nylon tube to BS5409 standard, colour black. Alternatively, site air may be used to supply the system independently.

[Section Spacing Page]

6 COMMISSIONING PROCEDURE

6.1 Pre-commissioning checks

Following installation, the ***AZTEC DO System*** should be visually inspected for signs of mechanical damage incurred during installation. Where damage is found **Severn Trent Services** should be notified for advice on whether to proceed with the commissioning phase. The following pre-commission checks must be carried out BEFORE the local isolator is placed in the ON position. Check and correct as necessary:

a) The mounting of the Main System Assembly is sound.

b) The power supply rating of ***AZTEC DO System*** is the same as the power supply provided.

c) Power supply terminations are secure, safe and in good condition.

d) Supplementary and equipotential bonding conductors are securely terminated and in good condition.

e) Protective shrouding and covers are secured in place and in good condition.

f) All fuses are sound, of the correct rating and in place. (See table or diagrams on the following page).

g) The DO cell is fitted to the DO Probe Assembly before it is immersed in the tank.

h) The signal cable from the DO Probe Assembly is connected into the Main System Assembly.

i) The three, pneumatic tubes from the DO Probe Assembly are connected to the corresponding pneumatic lines from the Main System Assembly.

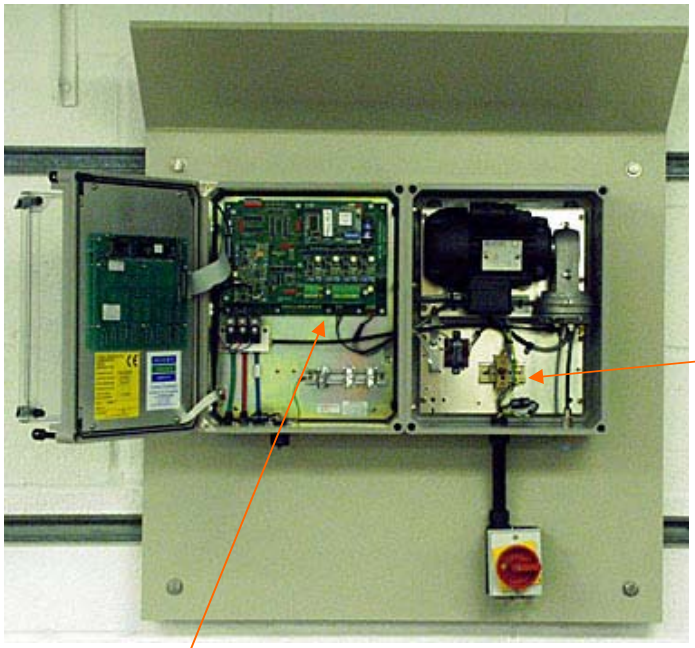
j) If a Local Control Box is included ensure that the air supply is connected to the black connector. This may be from the Main System Assembly if it contains its own compressor, or from a site air supply.

k) The positions of the DIP (DIL) switches on the Proteus module in the main electronics enclosure at the top right of the PCBs – refer to the section on serial communications, DIP command

l) Verify the DIP (DIL) switch positions (See Page 191 in the full manual). These will have been set in the factory. If changed accidentally, a cold restart will be necessary.

The items detailed in (a) to (l) above must be verified as being satisfactory before proceeding beyond this point.

Fuse ratings and positions



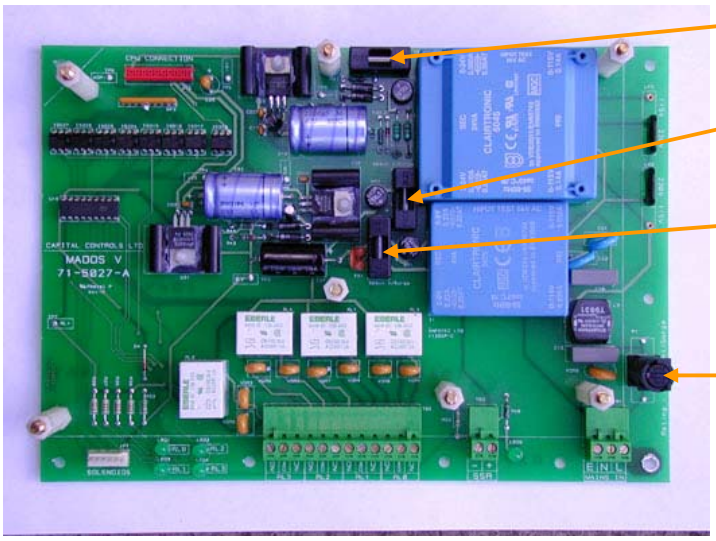


Figure 25 - Fuse ratings and location

6.2 Power up

It is necessary for the instrument to know the correct date and time before logging will occur. It also needs to know when it has a new DO sensor cell or cells installed. If the instrument has not been powered up before, it will do this automatically by performing a **cold start**. If it has been powered up before, it will perform a warm start. It will remember the set date and time but will need to be told if a new DO cartridge has been installed.

The procedure for both these situations is given below:

Cold Start

Clock Setting: On power up the following display requesting the user to set the clock will appear on the front panel

```
Power up          Cold start
```

Followed by:

```
Please set clock
```

Press '1' then '2' then '3' then '4' using the keypad on the front panel

The following menu will be displayed:

```
1.Clock   2. Manual  3. Probe  4. Quit
Use YES/NO or Num then ENT to select
```

Press '1' followed by 'ENT'

The following will be displayed:

```
 = = =  Clock Menu = = =
28/01/2003   15:06:23
```

Position the flashing cursor on the right hand side of the number to be changed. The cursor is moved to the right by pressing 'YES' and to the left by pressing 'NO'.

Note:

In all AZTEC instruments the date is in the United Kingdom format DD/MM/YY and the time is in 24-hour format HH:MM:SS. This format is hard-coded into the instrument's software and cannot be changed.

Press ‘ENT’
Key in the Day (the day number within the month)
Press ‘ENT’

Move the cursor to the next value to be changed and repeat the above for the month, year, hours and minutes until all the date and time fields have been set.

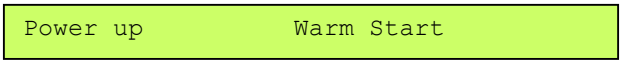
Press ‘DEL’
Press ‘YES’ to update the clock

Press ‘YES’ to display the date and time on the LCD.
Press ‘DEL’ to return to the main display.

The instrument will now automatically carry out an autocalibration.

Warm Start:

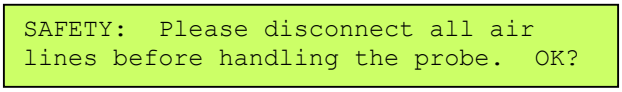
If the following message is shown on power up



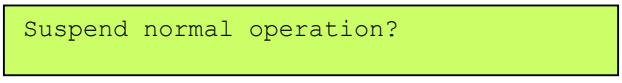
then the instrument has been powered up previously since leaving the factory and may have some appropriate sensor characteristics, logged data and user-settings stored in its memory that you wish to keep. In that case the following procedure should be adopted:

Press ‘9999’ (i.e. ‘9’ four times in succession)

A safety message will be displayed:



Press ‘YES’ followed by ‘ENT’



Press ‘YES’. If the instrument is a double DO you will be asked to select the sensor head. On a double-DO instrument head 1 is by the main panel; head 2 is by the Local Control Box.

Press ‘1’ followed by ENT.

Now press ‘DEL’. The following screen will be displayed:

```
1.Autocal  2.  Newcart  3. ZDO  4.Quit
Use YES/NO or Num then ENT to select
```

Press ‘1’ followed by ‘ENT’:

```
Trigger autocal?
```

Press ‘YES’. Now press 2 followed by ‘ENT’.

```
Does the carriage have a new span?
```

Press ‘YES’ followed by ‘DEL’

```
Resume normal operation?
```

If the instrument is a single-DO, then press ‘YES’; if the instrument is a double-DO then press ‘NO’ and you will be returned to the screen asking you to select a sensor head. This time press ‘2’ followed by ‘ENT’ and repeat the above sequence, then when asked to resume normal operation press ‘YES’.

The above procedure will ensure that the instrument recognises that it has a new cartridge (or cartridges if double DO.) and will automatically carry out calibrations on the head (or heads if double DO).

Even on warm starts one should check that the clock has been set correctly by carrying out the clock set procedures as previously described. The instrument will not log data until the clock has been set, and if set incorrectly will log data against the wrong data or time. The software will check the entered date and time and will reject any attempt to enter an illegal date and/or time.

When the instrument has completed its calibrations it should display either one or two “=” signs on the right hand side of the display depending on how many sensors it has. This will indicate that the calibration has been successful.

Please note that until this procedure has been completed any alarm signals or analogue output signals will be invalid, and data will not be logged correctly. It is important therefore, that any controls affected by alarm or analogue output signals are disabled until the initial calibration cycle has completed successfully.

☞ The AZTEC DO System is now basically operational, but will probably need further configuration to tailor it to individual requirements and preferences.

It is now time to configure the analogue and alarm outputs to tailor them to suit individual requirements. This is done by the outputs setup menu accessed by default by keying in '8888' on the keypad. Details of the procedure are given in section 8.

If you wish to enter corrections for altitude, depth of immersion, salinity or barometric pressure, please refer to sections 8.8 through to 8.11.

DO APPENDIX A – CERTIFICATE OF CONFORMITY

A copy of the certificate of conformity is available on request from:

Severn Trent Services
8 Hawksworth
Southmead Industrial Park
Didcot
Oxon
OX11 7HR
UK
Tel: +44 (0)1235 512000 ◆ Fax: +44 (0) 1235 512020

email: salesenq@severntrentservices.co.uk

DO APPENDIX B – WARRANTY EXCLUSIONS

The ***AZTEC DO System*** is subject to the terms and conditions of **Severn Trent Services** general instrument warranty.

Because of their consumable nature, certain items are excluded from this warranty and are listed below.

- Air filters
- DO Cell/Sensor cartridge
- DO Sensor membranes and “O” rings
- “O” rings
- DO Cleaning brush

Unless a **Severn Trent Services** authorised engineer installs and commissions the instrument, **Severn Trent Services** has no control over the conditions under which any sensors are used and as such the warranty for wet end components is dependent upon correct installation, handling, usage and application.

DO APPENDIX D – SOFTWARE LICENCE AGREEMENT

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LATIN AMERICA Severn Trent Services Water Purification Solutions 1110 Industrial Blvd Sugar Land TX 77478 USA Tel: 281 240 6762 Fax: 281 682 7700	CHINA Severn Trent Services Water Purification Solutions 129 Jinyu Plaza Rm. 0718 Xuanwumen Xidajie A Xicheng Qu Beijing 100031 China Tel: 86 10 6641-6802; 6641-6688 ext 8398, 8399 Fax: 86 10 6641-0032
MIDDLE EAST / NORTH AFRICA Severn Trent Services Water Purification Solutions 44 Palestine Street, 5th Floor New Maadi Cairo Egypt Tel: 202 703 2005 Fax: 202 703 2001	ASIA / PACIFIC Severn Trent Services Water Purification Solutions No 10a, Jalan SS21/58 Damansara Utama 47400 Petaling Jaya Selangor Malaysia Tel: 603 7727 6729 Fax: 603 7727 6815

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